

# *Invacare® Kite*

## *SERVICE MANUAL*



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These instructions contain information about:

Testing work

Repair Instructions

This manual is part of the instructions for use.

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# 1 Introduction

## 1.1 General information

- Service and maintenance work must be carried out taking this service manual into account.
- It is imperative that you observe safety information.
- Information about operation or about general maintenance and care work on the mobility aid should be taken from the operating manual.
- You can find information about ordering spare parts in the spare parts catalogue.
- Only use original Invacare® spare parts. The guarantee will become invalid if other spare parts are used!
- We reserve the right to make any alterations on the grounds of technical improvements.
- The mobility aid may only be maintained and overhauled by qualified personnel.
- The minimum requirement for service technicians is suitable training, such as in the cycle or orthopaedic mechanics fields, or sufficiently long-term job experience.
  - Experience in the use of electrical measuring equipment (multimeters) is also a requirement.
  - Special Invacare® training is recommended.
- Alterations to the mobility aid which occur as a result of incorrectly or improperly executed maintenance or overhaul work lead to the exclusion of all liability on the side of INVACARE.
- If you have any problems or questions please contact Invacare® Service.

## 1.2 Notes on shipping

- If the mobility aid has to be shipped back to the manufacturer for major repairs, you should always use the original packaging for transport.
- Please attach a precise description of the fault.



## 1.3 Definition and representation of information and safety information in this manual

Different types of information and signal words are used throughout this manual.



---

### HAZARD!

The signal word "HAZARD!" refers to immediate hazards.

- *The following lines in italics refer to actions which serve to avoid such hazards.*
- 



---

### WARNING!

The signal word "WARNING!" refers to possibly-occurring hazards which can lead to death or serious injuries if they are not avoided.

- *The following lines in italics refer to actions which serve to avoid such hazards.*
- 



---

### ATTENTION!

The signal word "ATTENTION!" refers to possibly-occurring hazards which can lead to minor injuries and/or material damage if they are not avoided.

- *The following lines in italics refer to actions which serve to avoid such hazards.*
- 



---

### CAUTION!

The signal word "CAUTION!" refers to hazards which could lead to material damage if they are not avoided.

- *The following lines in italics refer to actions which serve to avoid such hazards.*
- 



---

### Note

The signal word "Note" is used to denote general information which simplifies the handling of your product and refers to special functions.

---

## 1.4 Hazard symbols and symbols used

Different types of hazard symbols and symbols are used throughout this manual.



### General hazards

**This symbol warns you of general hazards!**

- Always follow the instructions to avoid injury to the user or damage to the product!



### BURN HAZARD!

**This symbol warns you of the danger of chemical burns, for example due to the discharge of battery acids!**

- Always follow the instructions to avoid injury to the user or damage to the product!



### DANGER OF CRUSHING!

**This symbol warns you of crushing hazards due to inattentive working with heavy components.**

- Always follow the instructions to avoid injury to the user or damage to the product!



### EXPLOSION HAZARD!

**This symbol warns you of an explosion hazard, which can be caused by excessive tyre pressure in a pneumatic tyre.**

- Always follow the instructions to avoid injury to the user or damage to the product!



### Wear safety shoes

**The symbol refers to the requirement for wearing safety shoes.**

- Wear standardised safety shoes during all work.



### Wear eye protection

**This symbol refers to the requirement for wearing eye protection, for example when working with batteries.**

- Wear eye protection when this symbol is shown.



### Wear safety gloves

**This symbol refers to the requirement for wearing safety gloves, for example when working with batteries.**

- Wear safety gloves when this symbol is shown.



### Note

This symbol identifies general information which is intended to simplify working with your product and which refers to special functions.



### Requirements:

- This symbol identifies a list of various tools, components and items which you will need in order to carry out certain work. Please do not attempt to carry out the work if you do not have the listed tools available.



### Always dispose used or damaged batteries correctly

The symbol refers to information for the correct disposal of used or damaged batteries.

## **1.5 Images in this manual**

The detailed images in this manual are given digits to identify various components. Component numbers in text and operational instructions always relate to the image directly above.

## 2 Safety and fitting instructions

These safety instructions are intended to prevent accidents at work, and it is imperative that they are observed.

### 2.1 Before any inspection or repair work

- Read and observe this repair manual and the associated operating manual!
- Observe the minimum requirements for carrying out the work (see chapter entitled " General information)!

### 2.2 Personal safety equipment



#### Safety shoes

The mobility device, and some of its components, are very heavy. These parts can result in injuries to the feet if they are allowed to drop.

- *Wear standardised safety shoes during all work.*



#### Eye protection

It is possible that battery acid can be discharged when working on defective batteries or when handling batteries improperly.

- *Always wear eye protection when working on any defective or possibly defective batteries.*



#### Safety gloves

It is possible that battery acid can be discharged when working on defective batteries or when handling batteries improperly.

- *Always wear acid-proof safety gloves when working on any defective or possibly defective batteries.*

### 2.3 General safety information and information about fitting / removal



#### WARNING: Danger of crushing!

Various components such as the drive unit, batteries, seat etc are very heavy. This results in injury hazards to your hands!

- *Please note the high weight of some components! This applies especially to the removal of drive units, batteries and the seat.*



#### WARNING!

**Injury hazard if the vehicle starts moving unintentionally during repair work!**

- *Switch the power supply off (ON/OFF key)!*
- *Engage the drive!*
- *Before jacking up, secure the vehicle by using chocks to block the wheels.*



#### ATTENTION!

**Fire and burn hazard due to electrical short-circuit!**

- *The mobility device must be completely switched off before removal of voltage-carrying components! To do this, remove the batteries.*
- *Avoid short-circuiting the contacts when carrying out measurements on voltage-carrying components!*

**CAUTION!****Danger of burns from hot surfaces on the motor!**

- *Allow the motors to cool down before commencing work on them.*

**ATTENTION!****Injury hazard and danger of damage to vehicle due to improper or incomplete maintenance work!**

- *Use only undamaged tools in good condition.*
- *Some moving parts are mounted in sockets with PTFE coating (Teflon™). Never grease these sockets!*
- *Never use "normal" nuts instead of self-locking nuts.*
- *Always use correctly-dimensioned washers and spacers*
- *When reassembling, always replace any cable ties which were cut during dismantling.*
- *After completing your work / before renewed start-up of the mobility device, check all connections for tight fitting.*
- *After completing your work / before renewed start-up of the mobility device, check all parts for correct locking.*
- *Only operate the vehicle with the approved tyre pressures (see technical data).*
- *Check all electrical components for correct function. Please note that incorrect polarity can result in damage to the electronics.*
- *Always carry out a trial run at the end of your work.*

**CAUTION!****Danger of injury and damage to property, if the maximum speed reduction on a wheelchair with a lifter does not function correctly!**

**The wheelchair's control unit must reduce the maximum possible speed as soon as the lifter is raised.**

- *Test the maximum speed reduction for correct function after any maintenance work or modifications to the wheelchair.*

**Note**

Mark all current settings for the mobility aid (seat, armrests, backrest etc.), and the associated cable connecting plugs, before dismantling. This makes reassembly easier. All plugs are fitted with mechanical safety devices which prevent release of the connecting plugs during operation. To release the connecting plugs the safety devices must be pressed in. When reassembling ensure that these safety devices are correctly engaged.

**CAUTION!****Any changes to the drive program can affect the driving characteristics and the tipping stability of the vehicle!**

- *Changes to the drive program may only be carried out by trained Invacare® specialist dealers!*
- *Invacare® supplies all mobility aids with a standard drive program ex-works. Invacare® can only give a warranty for safe vehicle driving behaviour - especially tipping stability - for this standard drive program!*

### 3 Tightening torques

The tightening torques stated in the following list are based on the thread diameter for the nuts and bolts for which no specific values have been determined. All values assume dry and de-greased threads.

Thread	M4	M5	M6	M8	M10	M12	M14	M16
Tightening torque in Nm $\pm 10\%$	3 Nm	6 Nm	10 Nm	25 Nm	49 Nm	80 Nm	120 Nm	180 Nm

**CAUTION!**

**Damage can be caused to the mobility device due to improperly tightened screws, nuts or plastic connections.**

- *Always tighten screws, nuts etc to the stated tightening torque.*
- *Only tighten screws or nuts which are not listed here fingertight.*

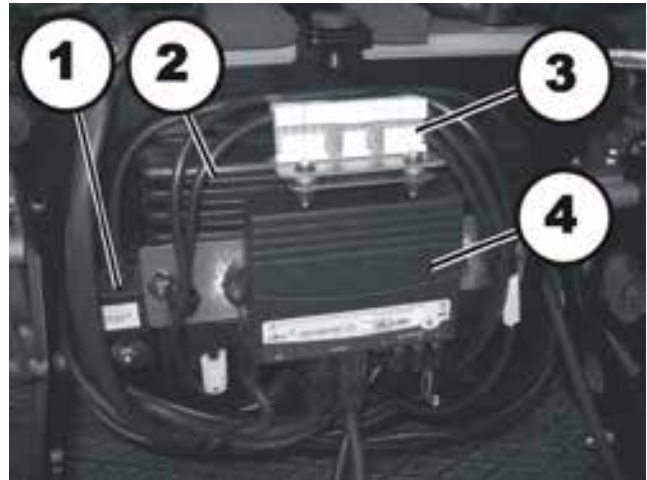
## 4 Layout of components and componentry

### 4.1 Overview

**Under the rear cover:**

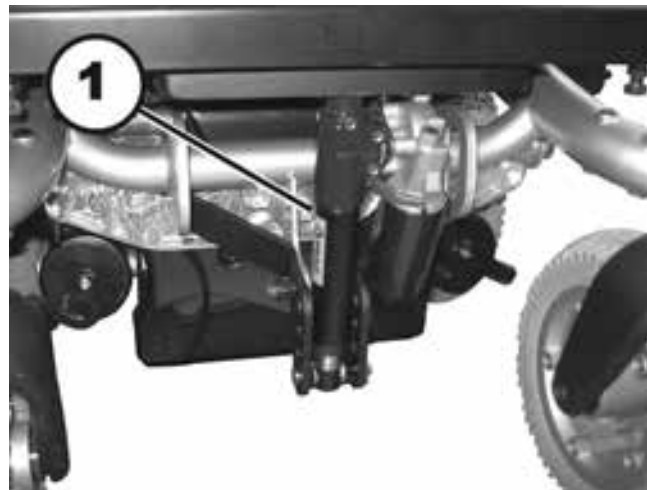
- 1) G-Trac sensor
- 2) Power module
- 3) Lighting PCB
- 4) Actuator module

The electronic modules used are described in Chapter 4.2.



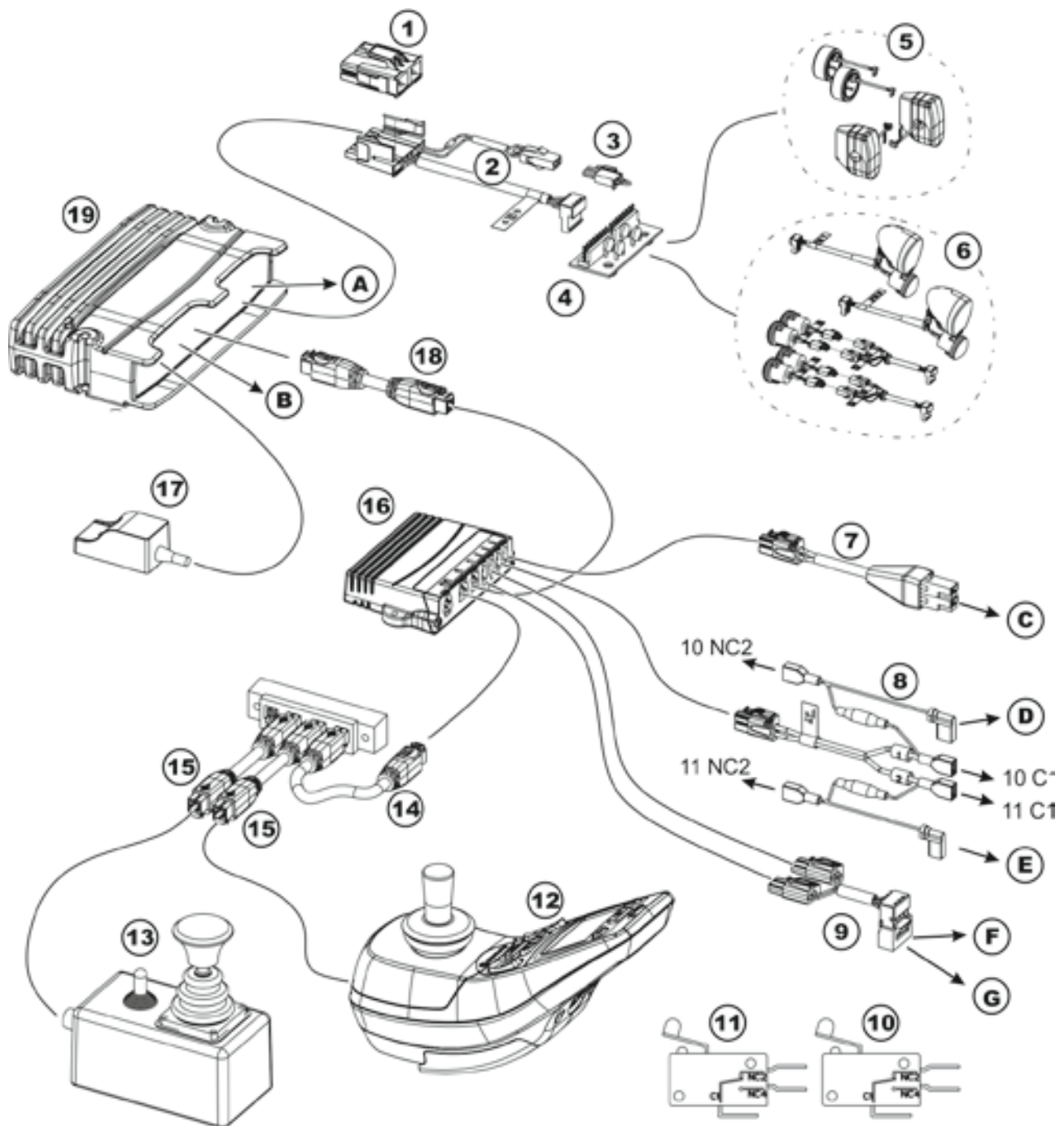
**Electric seat tilting:**

- 1) Actuator motor



## 4.2 Overview of the electronic modules (ACS 2 system)

Different electronic modules can be fitted to the mobility aid.



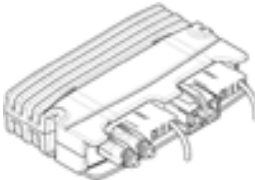
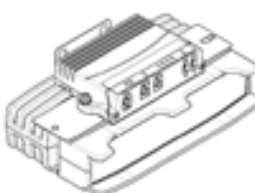
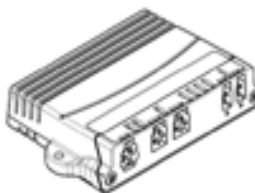
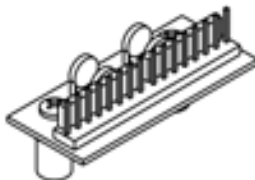
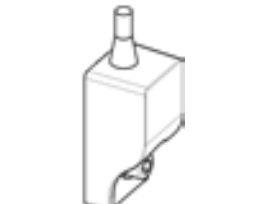

- 1 Battery plug
- 2 Lighting cable
- 3 Contact bridge
- 4 Lighting circuit board
- 5 Lighting according to German Road Traffic Act (StVZO).
- 6 LED lighting
- 7 Extension cable
- 8 Actuator cable lifter
- 9 Extension cable

- 10 End position switch "lower position"
- 11 End position switch "upper position"
- 12 Remotes
- 13 ACS attendant control, switchable
- 14 Bus cables
- 15 Bus cables
- 16 ACT

- 17 G-Trac sensor
- 18 Bus cables
- 19 Power module
- A To the motor M1
- B To the motor M2
- C To the tilt actuator
- D To the lifter actuator
- E To the lifter actuator
- F Actuator left legrest
- G Actuator right legrest



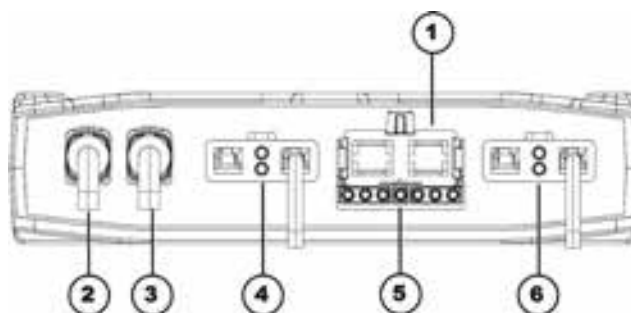
Before you connect mobility aid components such as actuators or motors, please begin by ascertaining which module is installed. Please refer to the following table for an overview of ACS 2 modules.

Electronicmodule	Name	Description
 	ACS 2 70 ACS 2 70L ACS 2 90L ACS 2 90L G  ACS 2 wiith ACT actuator module	See chapter 4.2.1 See chapter 4.2.1 See chapter 4.2.1 See chapter 4.2.2  See chapter 4.2.3 The actuator module is optional.
	Actuator module ACT 2 ACT 4	See chapter 4.2.3.1 See chapter 4.2.3.2 The actuator module is optional.
	Lighting PCB	See chapter 4.2.4 The lighting PCB is optional.
	G-Trac sensor	The G-Trac sensor is optional.
	Operation hour counter	The operation hour counter is optional.

### 4.2.1 ACS 2 70 / ACS 2 70L / ACS 2 90L electronic module

#### Connections

- 1) Battery 24V
- 2) Bus cable (to remote or ACT)
- 3) Bus cable (to remote or ACT)
- 4) Motor M1
- 5) Light (optional)
- 6) Motor M2



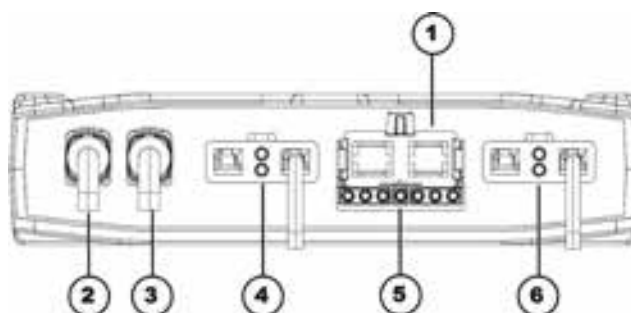
#### Rubber stoppers for free slots

- 2) & 3) Order number: 1552876

### 4.2.2 ACS 2 90LG electronic module

#### Connections

- 7) Battery 24V
- 8) Cable to G-Trac sensor (GYRO)
- 9) Bus cable (to remote or ACT)
- 10) Motor M1
- 11) Light
- 12) Motor M2



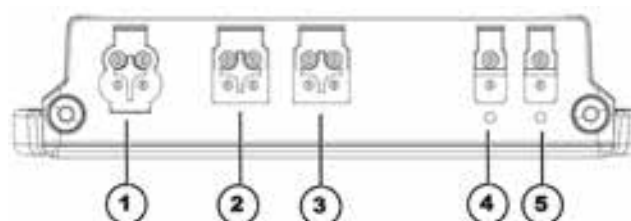
### 4.2.3 ACT actuator module

Different adjusting motors, also known as actuators, can be fitted to the mobility aid. These actuators are either connected directly to the power module or to a separate actuator module. The actuator module is connected to the power module via a bus cable.

#### 4.2.3.1 ACT 2 actuator module

#### Connections

- 1) ACI\*
- 2) Bus cable (ACT or power module)
- 3) Bus cable (ACT or power module)
- 4) Actuator - Channel 2
- 5) Actuator - Channel 1



#### Rubber stoppers for free slots

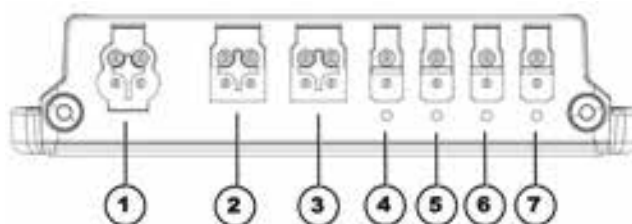
- 1) Order number: 1555701  
 2) & 3) Order number: 1552876  
 4) to 7) Order number: 1555700

\* The ACI connection is used for actuator limitation or speed reduction.

#### 4.2.3.2 ACT 4 actuator module

##### Connections

- 1) ACI\*
- 2) Bus cable (ACT or power module)
- 3) Bus cable (ACT or power module)
- 4) Actuator - Channel 4
- 5) Actuator - Channel 3
- 6) Actuator - Channel 2
- 7) Actuator - Channel 1



##### Rubber stoppers for free slots

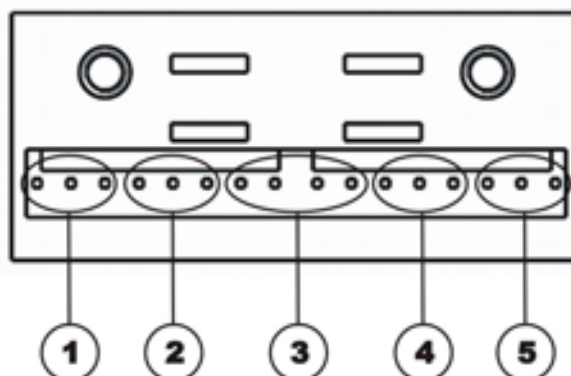
- 1) Order number: 1555701
- 2) & 3) Order number: 1552876
- 4) to 7) Order number: 1555700

\* The ACI connection is used for actuator limitation or speed reduction.

#### 4.2.4 Lighting PCB

##### Connections

- 1) Driving light & l.h. indicator 1
- 2) Driving light & l.h. indicator 2
- 3) Power module
- 4) Driving light & r.h. indicator 1
- 5) Driving light & r.h. indicator 2



The lighting PCB connections are printed directly on the circuit board.

## 5 Service plan (1x annually)



### CAUTION!

**Danger of injury and damage to property, if the maximum speed reduction on a wheelchair with a lifter does not function correctly!**

**The wheelchair's control unit must reduce the maximum possible speed as soon as the lifter is raised.**

- *Test the maximum speed reduction for correct function after any maintenance work or modifications to the wheelchair.*

Component	Check	Remedy	Notes	Ü
<b>Armrests</b>	• Damage to armrests	• Replace covering if damaged		
	• Armrest fixings	• Tighten screws		
<b>Side panels</b>	• Damage to side panels	• Replace side panels if damaged		
	• Side panel fixings	• Tighten screws		
<b>Seat lock</b>	• Seat lock defective	• Replace seat lock		
<b>Seat angle adjustment</b>	• Tight seating of SL fuses	• Replace SL fuses if necessary		
<b>Power backrest (if fitted)</b>	<ul style="list-style-type: none"> <li>• Damage to backrest</li> <li>• Seams</li> <li>• Fixing</li> <li>• Check cable</li> <li>• Check function</li> </ul>	<ul style="list-style-type: none"> <li>• Replace parts if damaged</li> <li>• Tighten screws</li> <li>• Replace cable motor if necessary</li> </ul>		
<b>Frames (chassis) / battery mounting</b>	• Check fixings, welded seams and battery mounting	<ul style="list-style-type: none"> <li>• Tighten screws</li> <li>• Replace components if necessary</li> </ul>		
<b>Wheel suspension and wheels</b>	• Check drive wheels for tight fit and side play	• Adjust, replace wheel hubs	See chapter 8.9.3.	
	• Check steering wheels for tight fit, float and side play	• Replace wheels, wheel fork or wheel bearings	See chapter 8.8.2	
	• Pneumatic tyres (if fitted)	• Repair or replace if damaged	See chapter 8.9.2.	
<b>Drive units, coupling mechanism</b>	<ul style="list-style-type: none"> <li>• Check functions in drive and push modes</li> <li>• Check coupling mechanism</li> </ul>	<ul style="list-style-type: none"> <li>• Replace motor if necessary.</li> <li>• Tighten screws/nuts, adjust or replace if necessary</li> </ul>		

Component	Check	Remedy	Notes	Ü
<b>Legrests</b>	<ul style="list-style-type: none"> <li>Check welded seams, interlocking, screws, footplates</li> </ul>	<ul style="list-style-type: none"> <li>Tighten, replace if necessary</li> </ul>		
<b>Power legrests (if fitted)</b>	<ul style="list-style-type: none"> <li>Check cable</li> <li>Check contacts</li> <li>check functions</li> </ul>	<ul style="list-style-type: none"> <li>Replace cable if necessary</li> </ul>		
<b>Lighting (if fitted)</b>	<ul style="list-style-type: none"> <li>Check cable</li> <li>Check function</li> </ul>	<ul style="list-style-type: none"> <li>Replace lamp or cable if necessary</li> </ul>		
<b>Batteries</b>	<ul style="list-style-type: none"> <li>Check batteries for damage</li> </ul>	<ul style="list-style-type: none"> <li>Replace batteries if necessary</li> </ul>	See chapter 8.4.	
	<ul style="list-style-type: none"> <li>Check battery voltage</li> </ul>	<ul style="list-style-type: none"> <li>Charge batteries</li> </ul>	See operating manual	
	<ul style="list-style-type: none"> <li>Check contacts and terminals</li> </ul>	<ul style="list-style-type: none"> <li>Clean contacts and terminals</li> </ul>	Please refer to the safety information in Chapter 8.4 for handling batteries	
<b>Remote / electronic module</b>	<ul style="list-style-type: none"> <li>Remote, status display blinking</li> </ul>	<ul style="list-style-type: none"> <li>Evaluate error/blink code</li> </ul>		
	<ul style="list-style-type: none"> <li>Fixings</li> </ul>	<ul style="list-style-type: none"> <li>Tighten fixings, replace if necessary</li> </ul>		
	<ul style="list-style-type: none"> <li>Cables and connecting plugs</li> </ul>	<ul style="list-style-type: none"> <li>Tighten cables and connecting plugs, replace if necessary</li> </ul>		
	<ul style="list-style-type: none"> <li>Drive lever function</li> </ul>	<ul style="list-style-type: none"> <li>Replace drive lever if necessary</li> <li>Replace remote if necessary</li> </ul>		
	<ul style="list-style-type: none"> <li>Power supply</li> </ul>	<ul style="list-style-type: none"> <li>Tighten cables and connecting plugs, replace if necessary</li> </ul>		
<b>Drive program</b>	<ul style="list-style-type: none"> <li>Check drive electronics program version</li> </ul>	<ul style="list-style-type: none"> <li>Update software if newer version available.</li> </ul>	See chapter 8.3.	

## 6 Operational faults

Different power modules can be installed in the mobility aid in connection with different remotes. The rectification of operational faults depends on the installed power module in each case.

The power modules used are described in 4.2.



### Note

The tables for rectification of operational faults listed in the following chapters are only an excerpt from the original manufacturer's manuals.

You can obtain the original manuals from Invacare®.

If you have problems with the mobility aid, please proceed as follows:

- First assess the possible cause of the problem using the following table.
- Check the remote status display. Evaluate the error code.
- Carry out the necessary checks and repairs as recommended in the following table.

### 6.1 Drive fault diagnosis

PROBLEM	OTHER SYMPTOMS	POSSIBLE CAUSE	SOLUTION	Documentation
<b>Mobility device will not start</b>	The remote status display illuminates normally and does not show an error code.	Drive motors disengaged	Engage drive motors	See operating manual
	Remote status display does not illuminate	batteries defective	Replace batteries	See chapter 8.4.
		Completely discharge battery	Pre-charge batteries	See operating manual
		Power supply to remote interrupted	Check master fuse	See chapter 8.5.
			Check cables between the modules for loose connections and damage	See chapter 8.6.
		Remote defective	Replace remote	See chapter 8.2.5.
	Remote status display blinking	Various causes	Assess error code	See chapter 6.2.

<b>Mobility device judders in drive mode</b>	None	Batteries defective (unstable voltage)	Replace batteries	See chapter 8.4.
		Drive motor(s) defective	Replace motor(s)	See chapter 8.10.1.
			Replace carbon brushes	See chapter 8.10.4.
<b>Batteries not being charged</b>	None	Batteries defective	Replace batteries	See chapter 8.4.
	LEDs blinking on charging unit	Charging unit defective	Replace charging unit	See charging unit operating manual
<b>Mobility device runs too slowly</b>	None	Remote defective	Replace remote	See chapter 8.2.5.
		Batteries defective	Replace batteries	See chapter 8.4.
<b>Electrical actuator does not respond</b>	Remote displays flashing "E", status diode on light/actuator module does not extinguish even if the remote is shut down or disconnected	Lighting/actuator or module faulty	Replace lighting/actuator module	See chapter 8.2.
	None	Cable disconnected or damaged	Ensure correct cable connection, replace cable if necessary	See chapter 8.6.
		Electrical actuator faulty	Check actuator	See chapter 7.3.
		Remote faulty	Replacing the remote	See chapter 8.2.5.

## 6.2 ACS2 remotes: Error codes and diagnostic codes

The drive electronics can automatically rectify some faults. In this case the status display will stop blinking. Switch the remote on and off again several times. Wait around 5 seconds each time before switching the remote on again. If this does not rectify the fault, determine the cause using the blink codes from the following table.

BLINK CODE	POSSIBLE CAUSE	SOLUTION	DOCUMENTATION
1 x blink	Module defective	Replace defective module	See chapter 8.2.
2 x blink	Accessory error (for example short circuit in the actuator)	Check accessory connections, check accessory	See chapter 7.3.
	Lifter too high or too low (seat not at driving height)	If the lifter is raised, lower it slowly until the status display stops blinking. If the lifter is too low, raise it slowly until the status display stops blinking. Only drive when the seat is at driving height.	See operating manual
3 x blink	Error in motor M1 Connection loose/faulty or motor faulty	Check connection plug, check motor	See chapters 8.6 and 7.1
4 x blink	Error in motor M2 Connection loose/faulty or motor faulty	Check connection plug, check motor	See chapters 8.6 and 7.1
5 x blink	Fault/brake fault in motor M1. Connection loose or faulty or motor faulty	Check connection plug, check motor	See chapters 8.6 and 7.1
6 x blink	Fault/brake fault in motor M2. Connection loose or faulty or motor faulty	Check connection plug, check motor	See chapters 8.6 and 7.1
7 x blink	Completely discharge battery	Pre-charge battery	See operating manual
8 x blink	Battery voltage too high	Switch lighting to low battery voltage Check battery charger	See charging unit operating manual
9 or 10 x blink	Faulty data transmission between modules	Remove electronic modules except for the power module and the remote. Replace the modules one after another in order to ensure which was the one causing the fault.	See chapter 8.2.
11 x blink	Drive motors overloaded / overheated	Switch remote on and off / wait if necessary	-
12 x blink	Compatibility problems between modules	Remove incorrect module	See chapter 8.2.



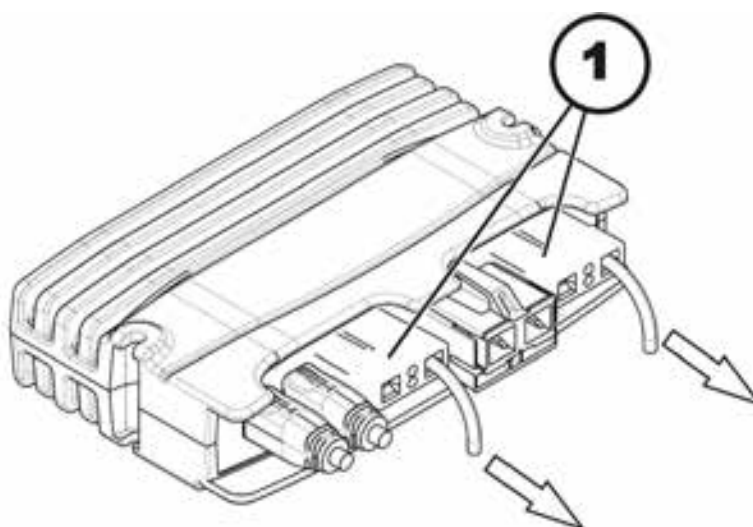
## 7 Test procedures

### 7.1 Testing the motor

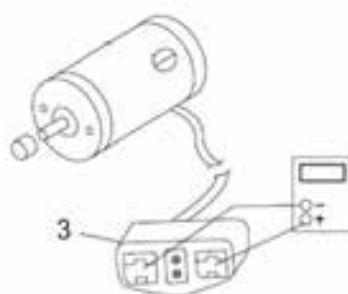
**Requirements:**

- digital multimeter with resistance measurement

- Use the remote to identify which motor is possibly defective, as described in chapter 6.2.
- Switch the electronics OFF on the remote.
- Remove the rear cover, as described in chapter 8.1.1.
- Take exact note of the positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.



- Disconnect the motor plug (1) of the motor to be tested from the power module.



- Connect the digital multimeter to the motor plug contacts (3) and measure the resistance between the contacts.

**Note**

A resistance of between 0.5 and 5 ohms indicates a motor ready for operation.

A resistance of between 15 ohms and infinity indicates a defective motor. High resistances are normally caused by bad connections or worn carbon brushes.

## 7.2 Testing the electro-mechanical parking brake

**Note**

This test should only be carried out on mobility aids with conventional motor/transmission units.

**CAUTION!**

**Material damage can be caused to the electronic module due to short-circuits in the electro-mechanical brake.**

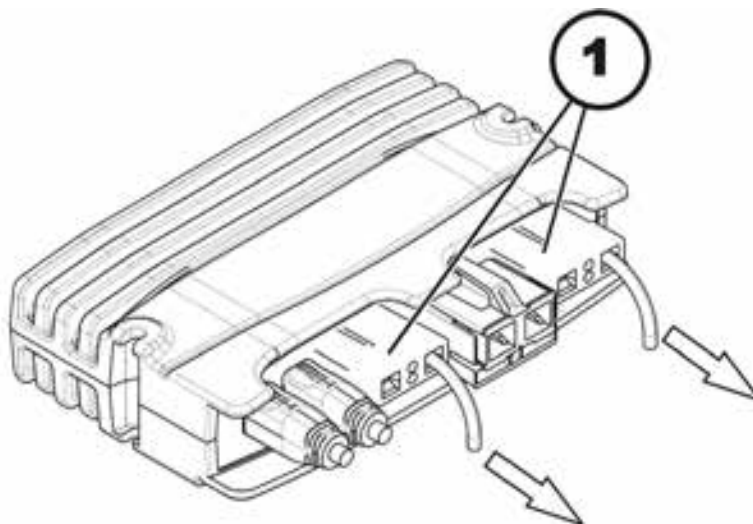
- *NEVER connect an electro-mechanical brake to an intact electronic module with a short-circuit!*
- *Always replace short-circuited brakes immediately.*

**Note**

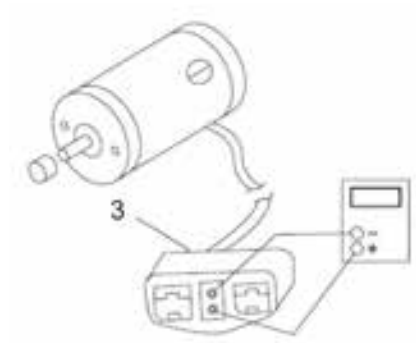
A defective motor can damage the power module, but a defective power module cannot damage the motor.

**Requirements:**

- digital multimeter with resistance measurement
- Use the remote to identify which motor is possibly defective, as described in chapter 6.2.
- Switch the electronics OFF on the remote.
- Remove the rear cover, as described in chapter 8.1.1.
- Take exact note of the positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.



- Disconnect the motor plug (1) of the motor to be tested from the power module.



- Connect the digital multimeter to the adjacent central motor plug contacts (3) and measure the resistance between the contacts.
- If there is a defect, replace the motor and send it to Invacare® Service for inspection or repair.

**Note**

A resistance of between 40 and 80 ohms indicates an intact brake.

A resistance of 0 ohms or a very high resistance (mega-ohms or infinity) indicates a short-circuit, a bad connection or a defective brake.

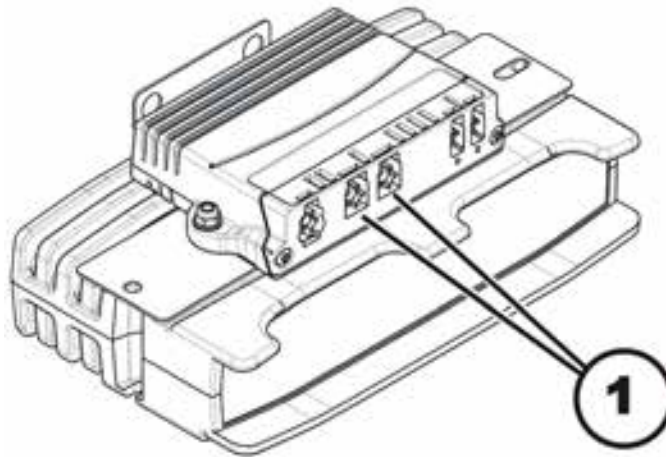
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## 7.3 Checking an actuator

**Requirements:**

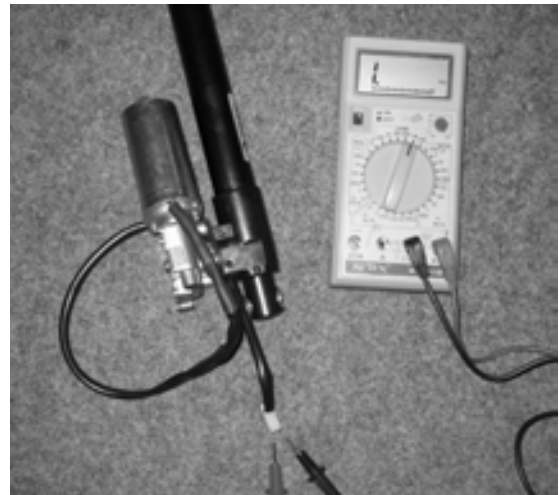
- digital multimeter with resistance measurement

- Switch the electronics OFF on the remote.
- Remove the rear cover, as described in chapter 8.1.1.
- Take exact note of the positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.



Disconnect the motor plug (1) of the motor to be tested from the actuator module.

- Check the electrical resistance at the plug (1) of the actuator.  
The plug can have a different shape than show in the illustration.
- If the resistance is close to infinity, the motor is probably burnt out.
- If the resistance is below 1 W, the motor has a short-circuit.
- The motor must be replaced in both cases.



## 8 Repair work



### CAUTION!

Danger of injury and damage to property, if the maximum speed reduction on a wheelchair with a lifter does not function correctly!

The wheelchair's control unit must reduce the maximum possible speed as soon as the lifter is raised.

- Test the maximum speed reduction for correct function after any maintenance work or modifications to the wheelchair.

### 8.1 Covers

#### 8.1.1 Rear cover



#### Removing the rear cover:

- Loosen and remove the left and right thumbscrews (1) on the rear cover (2).
- Carefully pull the rear cover backwards and off.
- On models with LED lighting system (tail lights in the rear cover): Pull both of the tail light plugs off of the lighting circuit board.

#### Assembling the rear cover:

- On models with LED lighting system: Plug both of the tail light plugs back into the lighting circuit board.
- Push the rear cover over the battery box from the back. Pay attention to the electrical cables while doing so.
- Tighten both thumbscrews hand-tight.

### 8.1.2 Middle cover

**Removing the middle cover:**

- Remove the rear cover, as described in chapter 8.1.1.
- Loosen the two thumbscrews (1) on the left and right sides of the wheelchair.
- Pull the cover towards the rear and out of the wheelchair.

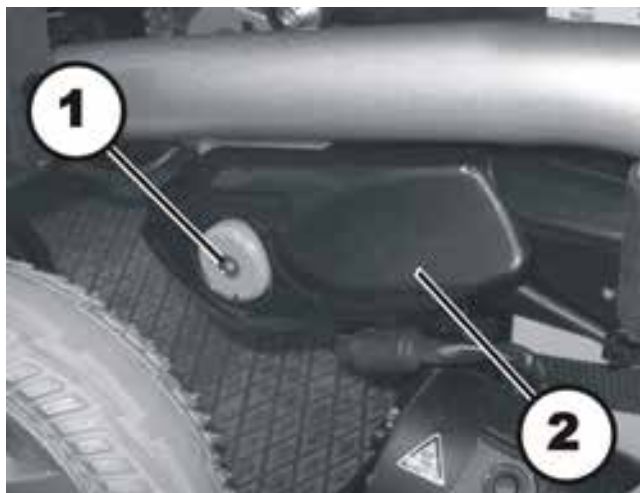
**Assembling the middle cover:**

- Push the cover into the wheelchair from the rear.
- Make sure that the cables that run from the battery box to the seat are lying in the recesses provided on the front edge of the cover.
- Tighten both thumbscrews hand-tight.

### 8.1.3 Side cover

**Requirements:**

- 4 mm Allen wrench

**Removing the side cover:**

- Use a 4 mm Allen wrench to loosen the hexagon socket head screw (1).
- Remove the cover (2).

**Installing the side cover:**

- Assemble the parts in reverse order.

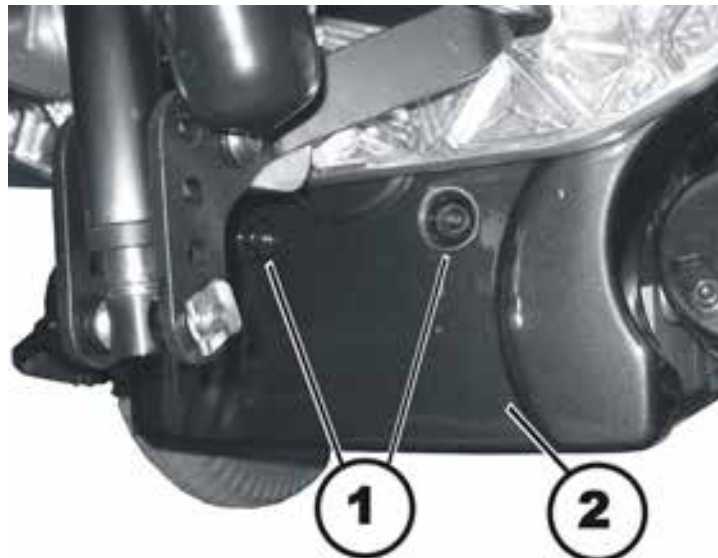
### 8.1.4 Front cover

**Requirements:**

- 4 mm Allen wrench
- 5 mm Allen wrench
- 10 mm Allen wrench
- 11 mm socket wrench
- 13 mm socket wrench
- 13 mm open-ended wrench
- 19 mm open-ended wrench
- 36 mm open-ended wrench
- 24 mm box wrench
- torque wrench 20 – 200 Nm
- wooden blocks

**Removing the front cover:**

- Disassemble the double bearing of the Dual Swing Technology (D.S.T.), as described in chapter 8.13.



- Use a 4 mm Allen wrench to loosen both hexagon socket head screws.
- Remove both hexagon socket head screws, including the washers.
- Remove the cover (2) towards the front.
- Replace the cover.

**Installing the front cover:**

- Assemble the parts in reverse order.



## 8.2 Electronic modules

### 8.2.1 Replacing the power module

**Note**

When replacing the power module in connection with a remote, please take the final selection of the drive program into account as described in chapter 8.2.6.

Different power modules in connection with different remotes can be fitted to the mobility aid. The possible power modules are described in chapter 4.2.

Replacement is described in the following section based on the example of a mobility aid with an optional lighting PCB and an optional actuator module.

**CAUTION!**

**Any changes to the drive program can affect the driving characteristics and the tipping stability of the mobility aid!**

- *Changes to the drive program may only be carried out by trained Invacare® specialist dealers!*
- *Invacare® can only give a warranty for safe mobility aid driving behaviour - especially tipping stability - for unaltered standard drive programs!*

**Note**

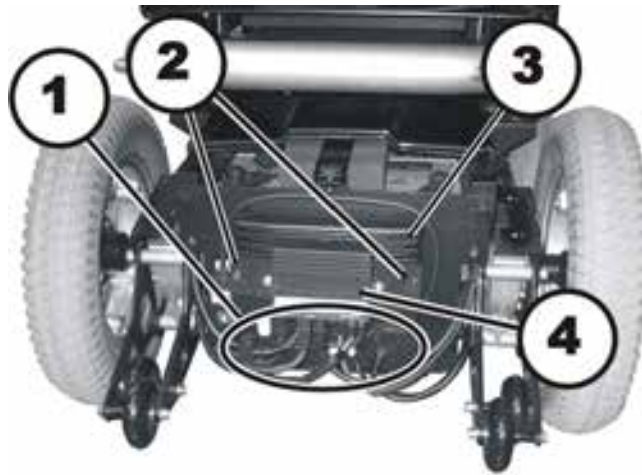
All power modules are delivered with a standard drive program. If you have made any customer-specific modifications to the drive program, these must be adapted after the installation of the new power module.

**Requirements:**

- 8 mm socket spanner
- To adapt the drive program:  
programming software or hand programming device and system installation manual, available from Invacare®.

**Removing the power module:**

- Switch the electronics OFF on the remote.
- Remove the rear cover, as described in chapter 8.1.1.
- Take exact note of the positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.



- Disconnect the plugs (1) from the power module (3) and from the actuator module (4).
- Use the 8 mm socket wrench to loosen both nuts (2).
- Pull the actuator module with the holder towards the rear and off of the guides.
- Pull the power module towards the rear and off of the guides.
- Replace the power module.

**Installing the power module:**

- Assemble the parts in reverse order.
- Reconnect all cable connectors to their former positions.
- Plug all free slots with a suitable rubber stopper, see chapter 4.2.
- Select the driving program, as described in chapter 8.2.6.
- Update the driving program if a new software version is available, as described in chapter 8.3.
- Modify the driving program using the programming software as needed.
- The last step is to test all functions of the vehicle.

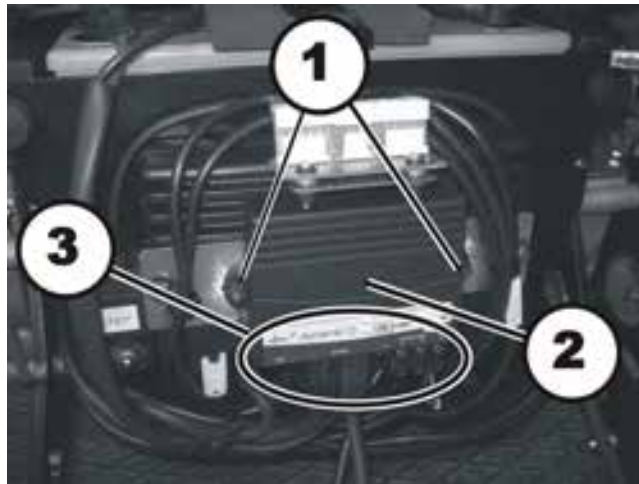
## 8.2.2 Replacing the actuator module

**Requirements:**

- 7 mm socket wrench
- Phillips screwdriver, size 2

**Removing the actuator module:**

- Switch the electronics OFF on the remote.
- Remove the rear cover, as described in chapter 8.1.1.
- Take exact note of the positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.



- Disconnect the plugs (3) from the actuator module (2).
- Loosen both screws (1) with a Phillips screwdriver.
- Replace the actuator module.

**Installing the actuator module:**

- Assemble the parts in reverse order.
- Reconnect all cable connectors to their former positions.
- Plug all free slots with a suitable rubber stopper, see chapter 4.2.
- The last step is to test all functions of the vehicle.

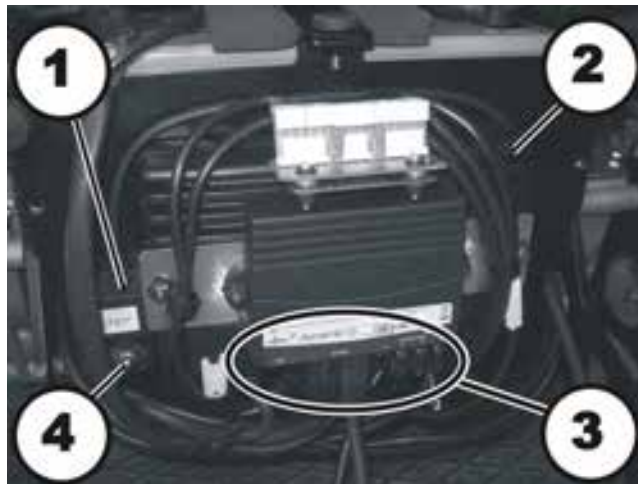
### 8.2.3 Replacing the G-Trac sensor

**Requirements:**

- 10 mm open-ended wrench

**Uninstalling the G-Trac sensor:**

- Switch the electronics OFF on the remote.
- Remove the rear cover, as described in chapter 8.1.1.
- Take exact note of the positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.



- Disconnect the plug (3) of the G-Trac sensor (1) from the power module. (2).
- Loosen the M6 nut (4) and push the G-Trac sensor upwards.
- Pull the G-Trac sensor backward and out.
- Replace the G-Trac sensor.

**Installing the G-Trac sensor:**

- Insert the square-end piece into the slot provided for this purpose.
- When installing the G-Trac sensor, make sure it is positioned exactly vertical.
- Reconnect all cable connectors to their former positions.
- The last step is to test all functions of the vehicle.

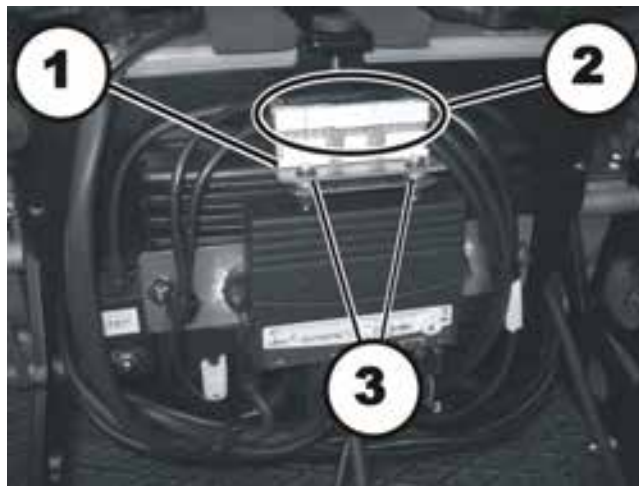
## 8.2.4 Replacing the lighting circuit board

**Requirements:**

- 8 mm open-ended wrench
- Phillips screwdriver, size 2

**Uninstalling the lighting circuit board:**

- Switch the electronics OFF on the remote.
- Remove the rear cover, as described in chapter 8.1.1.



- Take exact note of the positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.
- Disconnect the plug (2) from the lighting circuit board (1).
- Loosen and remove both screws on the lighting circuit board (3).
- Replace the lighting circuit board.

**Installing the lighting circuit board:**

- Assemble the parts in reverse order.
- Reconnect all cable connectors to their former positions.
- The last step is to test all functions of the vehicle.

### 8.2.5 Replace remote

**Note**

Replacing the remote is very easy and is not described in detail.

However, when replacing a remote in connection with the power module, please take the final selection of the drive program into account as described in chapter 8.2.6.

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**Special instructions for replacing the REM24 remote****Requirements:**

- To modify a drive programme you will need:  
Programming software or a hand-held programming device and the installation manual, available from Invacare®.

**Note**

All electronic modules are supplied with a standard drive programme. If you have performed customer-specific modifications to the drive programme, then these will need to be recreated manually after installing the new electronic module.

**WARNING!**

**Every alteration to the drive programme can influence vehicle handling and the tipping stability of the wheelchair!**

- *Alterations to the drive programme must only be carried out by authorised Invacare® dealers!*
- *Invacare® can only assume a warranty for the safe vehicle handling of the wheelchair – in particular tipping stability - for this standard, unaltered drive programme!*

## 8.2.6 Drive program selection after component replacement

The drive program is saved in the remote and in the power module. If one of these two components is replaced, the system must be told which of the components has not been replaced so that it knows which contains the current controller profile.



### Note

The system allows normal usage of the mobility aid after component replacement only if the profile is selected afterwards.

### 8.2.6.1 Profile selection with remote REM A or REM B



- Insert the plug into the remote or into the power module respectively.
- Switch the remote on.
- LEDs (1) and (4) blink.
- Use the bottom rocker switch (5) to select where the required controller profile is saved.
  - LED 1 = power module
  - LED 4 = remote

Only LED (1) or (4) blinks now depending on the selection.

- Press the "Horn" (2) and "+" (3) buttons on the speed selection and hold them down for 3 seconds to confirm the selection.

The system will switch itself off and restart automatically. In the process, the selected profile is saved in the remote and in the power module.

### 8.2.6.2 Profile selection with remote REM 550



- Insert the plug into the remote or into the power module respectively.
- Switch the remote on.

The display (2) shows that you need to select a profile.

- Use the bottom rocker switch (3) to select where the required controller profile is saved.
  - I = remote
  - II = power module

The display shows which profile you have selected.

- Press the "Horn" (4) and "+" (1) buttons on the speed selection and hold them down for 3 seconds to confirm the selection.

The system will switch itself off and restart automatically. In the process, the selected profile is saved in the remote and in the power module.



## 8.3 Updating the driving program

The driving programs for electric wheelchairs are continually updated and improved by Invacare®. For this reason, you should check whether the version number is still up to date each time a wheelchair comes in for repairs, and also during regular inspections.

If a newer version is available, the driving program must be updated. The procedure for updating the driving program is described in the user manual of the Wizard software.



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**Note**

The electronic system is supplied with a standard drive program. If the driving program has been customised, you have to perform this customisation again, after installing the new driving program. This also applies to the customer-specific options of the seat setting for ACS 2 remotes, which are activated ex works.

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**WARNING: Every alteration to the drive program can influence vehicle handling and the tipping stability of the wheelchair!**

- *Alterations to the drive program must only be carried out by trained Invacare®-dealers!*
  - *Invacare® can only assume a warranty for the safe vehicle handling of the wheelchair – in particular tipping stability - for unaltered standard drive programs!*
- 



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**Pre-requisites:**

- Dynamic® Wizard software
  - User manual for the Wizard software
  - For further information on other requirements - such as the minimum system configuration of the PC to be used for programming, necessary programming cables - see the user manual of the Wizard software. You find the latest version of the user manual in the download area on <http://www.dynamiccontrols.com/>.
- 



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**Note**

When an electrical adjustment option is retrofitted, such as electrical legrests, then this option needs to be activated in the driving program as well if you have an ACS 2 remote. For more information, refer to the user manual of the Wizard software and the installation instructions for the electronic modules

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## 8.4 Batteries

### 8.4.1 Removing the batteries


**ATTENTION:**
**Injury hazard and possible material damages if batteries are handled improperly!**

- The installation of new batteries may only be carried out by authorised specialists.
- Observe the warning information on the batteries.
- Only use battery versions stated in the specifications.


**ATTENTION:**
**Fire and burns hazard if battery terminal is bypassed!**

- Please take great care to ensure that the battery terminals are never short-circuited with tools or mechanical mobility device parts!
- Ensure that the battery terminal caps have been replaced if you are not working on the battery terminals.


**ATTENTION: Danger of crushing!**
**The batteries are extremely heavy. This results in injury hazards to your hands.**

- Bear in mind that the batteries are sometimes very heavy!
- Please handle the batteries with care.


**WARNING: BURN HAZARD!**
**Injury hazard due to discharged acid.**

- Always wear acid-proof protective gloves when handling batteries.
- Always wear protective goggles when handling batteries.


**What to do if acid is discharged:**

- Always take clothing which has been soiled by or dipped in acid off immediately!
- Rinse any areas of your skin which has come into contact with battery acid off immediately with plenty of water!

**If contact with eyes is made:**

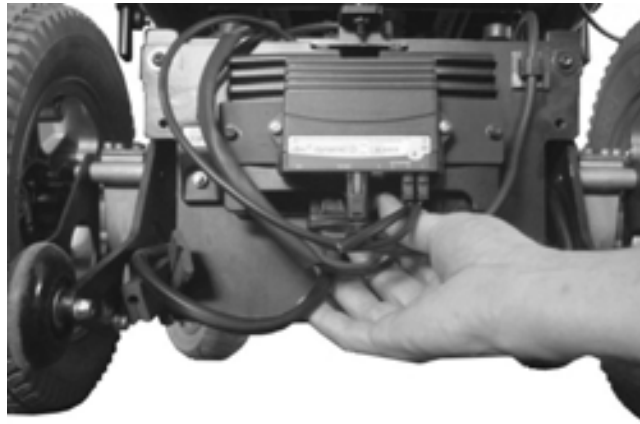
- Rinse the affected eye under running water for several minutes! You should also consult an eye specialist immediately afterwards!


**Requirements:**

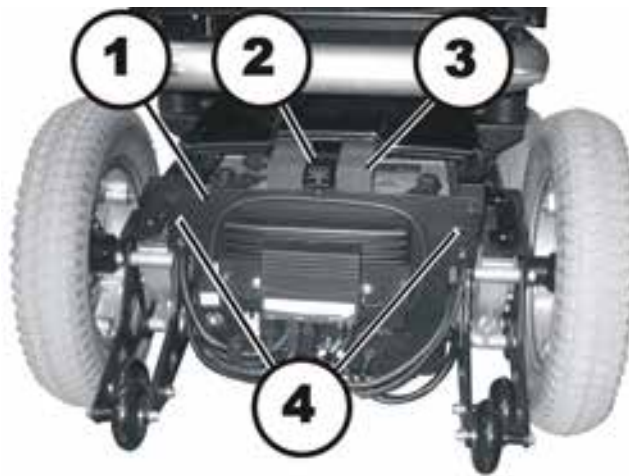
- 11 mm socket wrench

**Uninstalling the batteries:**

- Switch the electronics OFF on the remote.
- Remove the rear cover, as described in chapter 8.1.1.



- Disconnect the battery cable from the electronic module.



- Loosen and remove both of the knurled head screws (4).
- Loosen and remove the knurled head screws (2).
- Turn the rear cover (1) down along with the electronic modules.
- Pull foam rubber block (3) backwards out of the battery box.



- Pull the rubber caps (2) off of both battery terminals (1).
- Use the 11 mm socket wrench to loosen and remove the battery terminal screws.
- Remove the battery cable.
- Pull the battery (3) out onto the rear cover by its belt (4).
- Remove the battery.
- Pull the second battery towards you by its belt and repeat the previous steps.

**Installing batteries:**

- Install the batteries in reverse order.
- Make sure the battery box sockets and plugs are correctly installed. A diagram showing how to connect the battery terminals correctly can be found in the rear cover.

### 8.4.2 Correct handling of damaged batteries



---

**WARNING: BURN HAZARD!****Injury hazard due to discharged acid.**

- *Always wear acid-proof protective gloves when handling batteries.*
- *Always wear protective goggles when handling batteries.*

**What to do if acid is discharged:**

- *Always take clothing which has been soiled by or dipped in acid off immediately!*
- *Rinse any areas of your skin which has come into contact with battery acid off immediately with plenty of water!*

**If contact with eyes is made:**

- *Rinse the affected eye under running water for several minutes! You should also consult an eye specialist immediately afterwards!*
- 



---

**Requirements:**

- protective goggles
  - acid-proof gloves
  - acid-proof transport container
- 

- If handling damaged batteries, always wear suitable protective clothing.
  - Always deposit damaged batteries in suitable acid-proof containers immediately after removal.
  - Only transport damaged batteries in suitable acid-proof containers.
  - Always wash any objects which were contacted by acid in plenty of fresh water.
- 



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**Always dispose of used or damaged batteries correctly**

Used and damaged batteries will be taken back by your medical equipment supplier or Invacare®.

---

## 8.5 Checking and replacing the main fuse



### CAUTION: Fire hazard!

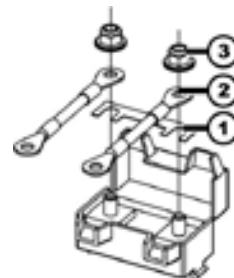
- Always use an original strip fuse with the approved amperage.
- If the main fuse has blown, first rectify the cause before fitting a new one.



### CAUTION: Fire hazard!

#### Fitting the incorrect strip fuse causes a fire hazard!

- Only fix the strip fuses in the sequence shown in the image on the right!
- Tighten the nuts with 3.3 or 3.5 Nm!



- 1. Strip fuse
- 2. Spade terminal
- 3. DIN 6923 nut



### Requirements:

- 8 mm socket wrench
- 11 mm socket wrench
- 80 A strip fuse

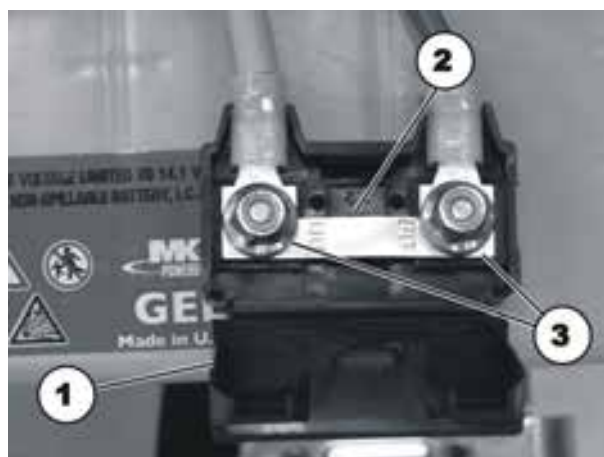


### Note

If the fuseholder is damaged, you can replace this complete with the battery cables.

### Dismantling the main fuse:

- Switch the electronics OFF on the remote.
- Remove the rear battery, as described in chapter 8.4.
- The fuse holder is located on top of the rear battery.
- Open the fuseholder cover.



- You see the strip fuses (2) once the fuse holder (1) is open.
- If the strip fuse has blown, you must first ascertain and rectify the cause of the fault.

- The main fuse may only be replaced once the fault has been rectified.
- Remove the strip fuse nuts (3) with an 8 mm socket spanner.
- Replace the strip fuse.

**Fitting the main fuse:**

- Refit all the parts again in reverse order.
- To conclude, check all the mobility aid functions.

## 8.6 Checking the cables

- Switch the electronics OFF on the remote.
- Remove the rear cover, as described in chapter 8.1.1.
- Check all cables for visible damage, crushing points or abrasion points.
- Replace damaged cables.
- Pull on each plug carefully. The plug must not come out of its socket when pulled on lightly.
- If a plug is loose, apply slight pressure to push the plug into the socket. The plug must snap in place securely.
- Check that the plug is firmly attached to its socket.
- Remove the batteries, as described in chapter 8.4.
- Check the battery cables for visible damage, crushing points or abrasion points.
- Replace damaged cables.
- Assemble all parts again in reverse order.
- The last step is to test all functions of the vehicle.



## 8.7 Lighting system

### 8.7.1 Replacing front headlight completely (LED lighting unit)

**Note**

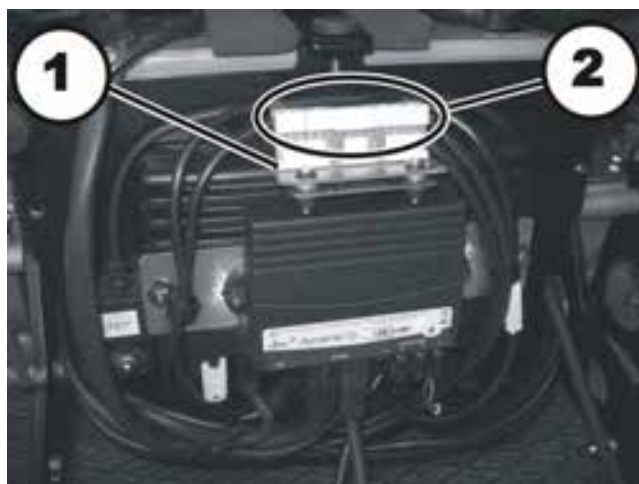
Replacing an individual LED is not possible. If there is a defect, replace the entire front headlight.

**Requirements:**

- Jaw spanner 7 mm
- Allen key 3 mm
- oblique pliers
- cable binder

**Uninstalling head lamps:**

- Switch the electronics OFF on the remote.
- Remove the rear and the middle covers, as described in chapter 8.1.1 und 8.1.2.
- Take exact note of the positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.



- Disconnect the plug (2) of the appropriate headlight from the lighting circuit board (1).
- Pull the headlight cable out of the wheelchair. If necessary, also remove the cable ties.



- Remove the front headlight plug from the lighting PCB.
- Free the cable or remove any cable ties.
- Loosen the nut (2) with a 7 mm jaw spanner and a 3 mm Allen key.
- Remove the front headlight (1) from the lamp holder (3).
- Reassembly takes place in the reverse order.
- To complete, check all vehicle functions.

### 8.7.2 Replacing the front bulb holder (LED lighting unit)

**Requirements:**

- Jaw spanner 7 mm
- Allen key 3 mm
- TX25 torx screwdriver
- oblique pliers
- cable binder



- Loosen the nut (2) with a 7 mm jaw spanner and a 3 mm Allen key and remove.
- Remove the front headlight (1) from the lamp holder (3) and place it carefully to the side.



- Undo and remove the two screws (4) with a TX25 torx screwdriver.
- Replace the lamp holder (3).
- Reassembly takes place in the reverse order.
- To complete, check all vehicle functions.

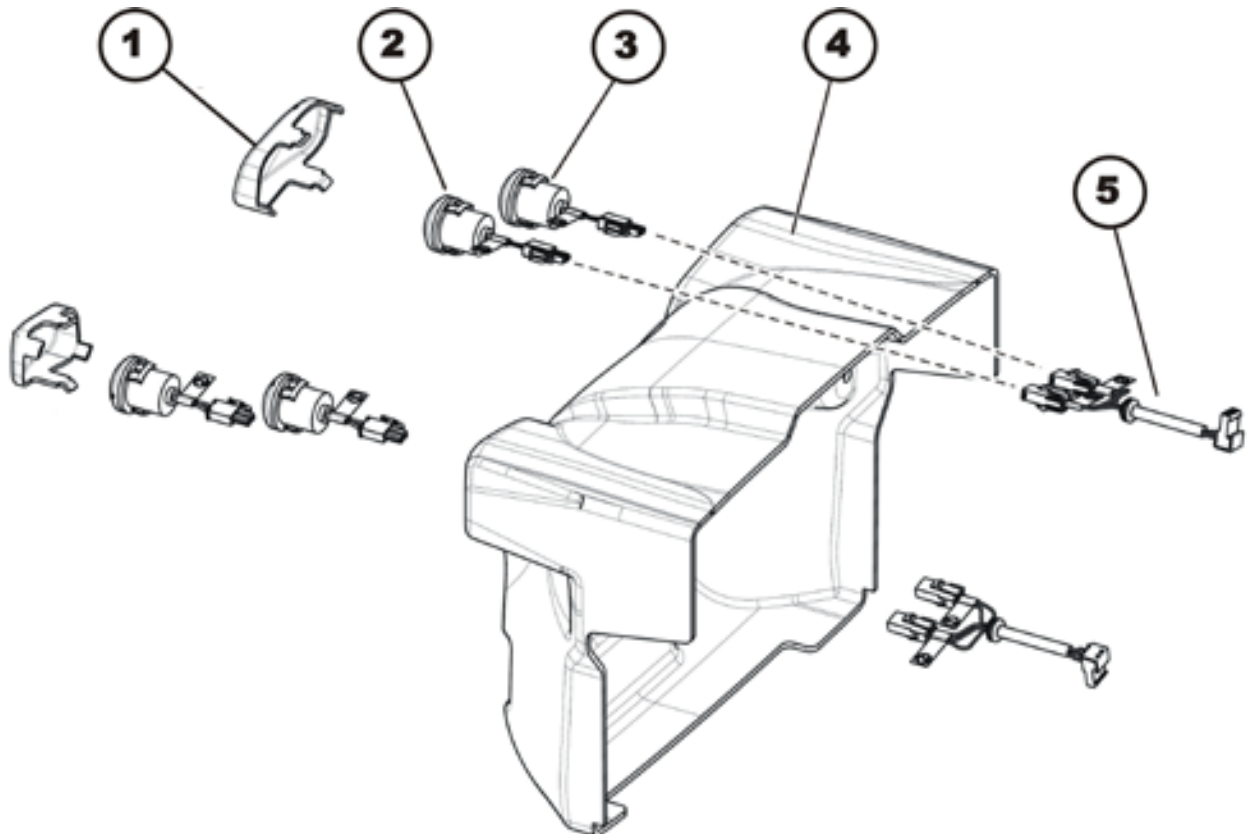
### 8.7.3 Replacing the rear light completely (LED lighting unit)

**Note**

Replacing an individual LED is not possible. If there is a defect, replace the entire rear light.

**Uninstalling the tail light:**

- Switch the electronics OFF on the remote.
- Remove the rear cover, as described in chapter 8.1.1.



? Press the clips of the tail light lens (1) together slightly.

- Pull the tail light lens carefully off of the rear cover (4).
- Disconnect the plug of the tail light (2) and of the turn signal (3) from the tail light cable (5).
- Press the clips of the tail light lens or the turn signal together slightly.
- Pull the corresponding light towards the rear and out of the rear cover.
- Replace the faulty part.

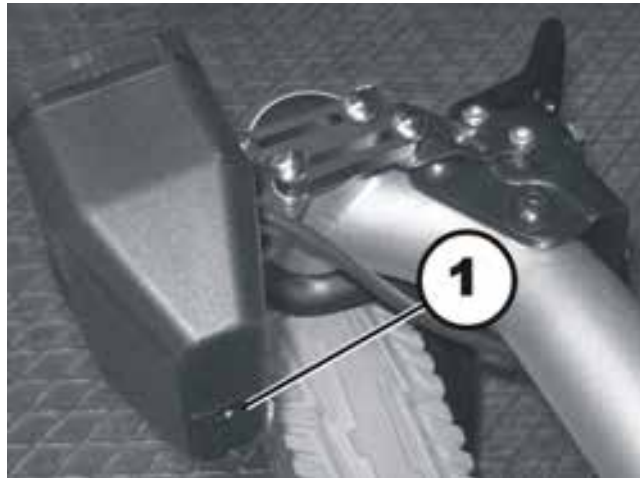
**Installing the tail light:**

- Re-assembly is done in reverse order.
- Pay attention to markings on the plugs of the tail light cable, of the tail light and of the turn signal.
- Test all functions of the vehicle.

#### 8.7.4 Replacing light bulbs in the front (Conventional lighting system)

**Requirements:**

- Phillips screwdriver size 2



- Loosen the concealed Phillips head screw (1) on the back of the head lamp / turn indicator combination.
- Remove the transparent plastic cover.
- Replace the defective light bulb.
- Reposition the cap and tighten the Phillips head screw hand-tight.

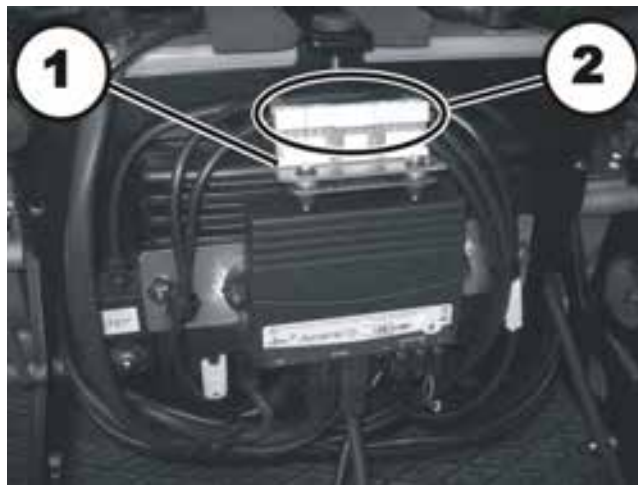
### 8.7.5 Replacing the head lamps completely (conventional lighting system)

**Requirements:**

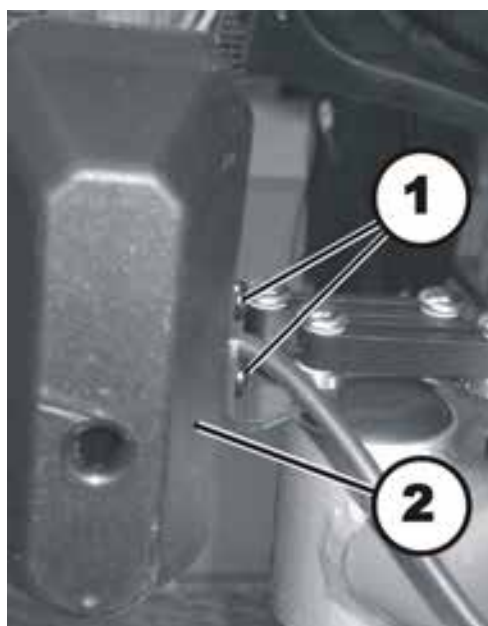
- Phillips screwdriver size 2
- Side cutting pliers
- Cable ties

**Uninstalling head lamps:**

- Switch the electronics OFF on the remote.
- Remove the rear and the middle covers, as described in chapter 8.1.1 und 8.1.2.
- Take exact note of the positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.



- Disconnect the plug (2) of the appropriate headlight from the lighting circuit board (1).
- Pull the headlight cable out of the wheelchair. If necessary, also remove the cable ties.



- Loosen both Phillips screws (1).
- Detach the headlight from its holding bracket.
- Replace the headlight.

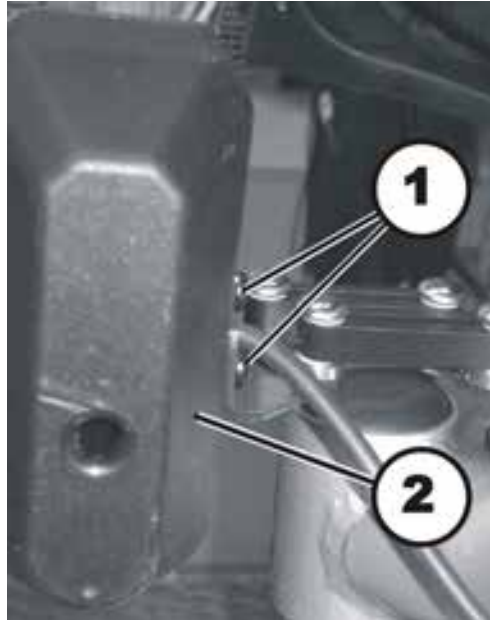
**Installing headlights:**

- Assemble all parts again in reverse order.
- Install the cables carefully and secure them with cable ties.
- Tighten the screws hand-tight.
- Check all vehicle functions.
- Perform an approximate adjustment of the headlight using the ratchet plate as a guide. The final adjustment can be performed by the user according to the instructions found in the User Guide.

### 8.7.6 Replacing the headlight bracket (conventional lighting system)

**Requirements:**

- TX25 Torx wrench
- Phillips screwdriver size 2

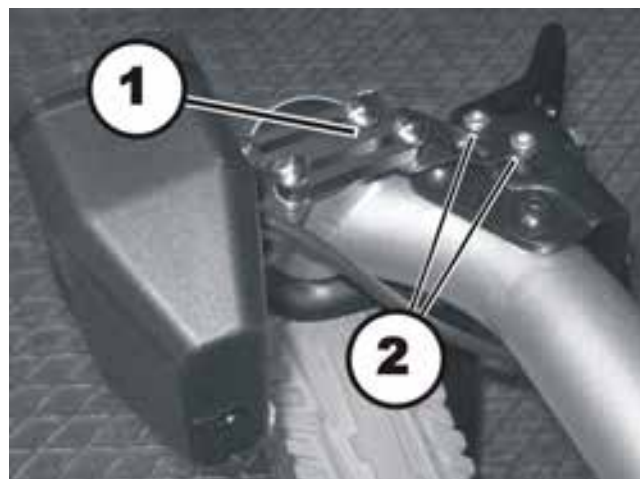


If the headlight does not need to be replaced:

- Loosen both Phillips screws (1).
- Detach the headlight (2) from its holder.
- Carefully put the headlight aside on its cable.

If the headlight does need to be replaced:

- Remove the headlight, as described in chapter 8.7.5.

**Uninstalling the headlight bracket:**



- Loosen both Torx screws (2).
- Remove the headlight bracket (1).
- Replace the bracket.

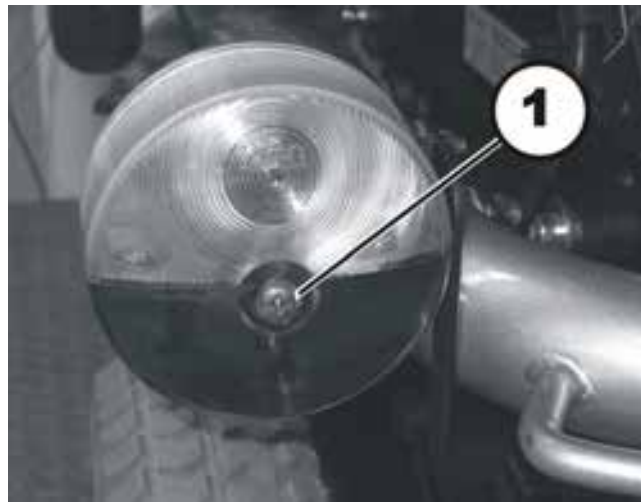
**Installing the headlight bracket:**

- Assemble all parts again in reverse order.
- Tighten the screws hand-tight.
- Check all vehicle functions.

### 8.7.7 Replacing the rear bulb (conventional lighting unit)

**Requirements:**

- Phillips screwdriver size 2



- Undo the Phillips screw in the transparent cover over the rear light/indicator combination.
- Remove the transparent plastic cover.
- Replace the defective bulb.
- Close the cover and tighten the Phillips screw finger-tight.

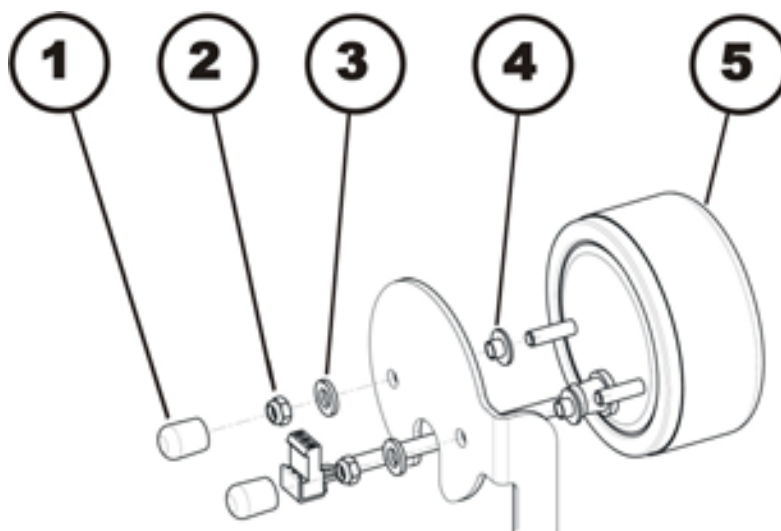
### 8.7.8 Replacing the complete tail light assembly (conventional lighting system)

**Requirements:**

- 8 mm socket wrench

**Uninstalling the tail light:**

- Switch the electronics OFF on the remote.
- Remove the rear cover, as described in chapter 8.1.1.
- Take exact note of the positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.
- Disconnect the cable of the affected tail light from the lighting circuit board.



- Remove both plastic covers (1).
- Use the 8 mm socket wrench to loosen both nuts (2).
- Remove the nut and the washers (3).
- Pull the tail light (5) towards the rear and off and remove both bushings (4).

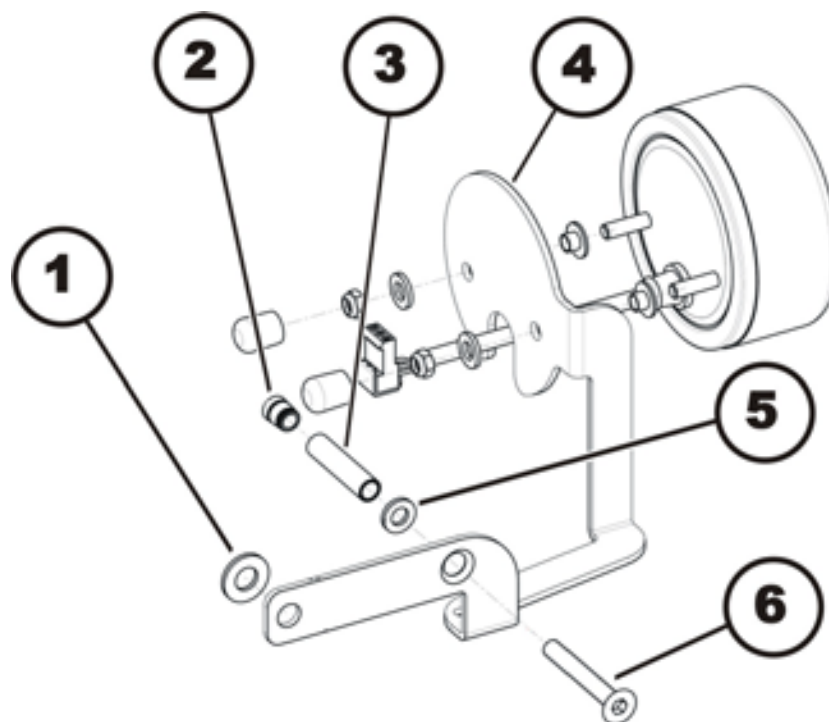
**Installing the tail light:**

- Assemble all parts again in reverse order.
- Tighten the screws hand-tight.
- Check all vehicle functions.

### 8.7.9 Replacing the tail light bracket (conventional lighting system)

**Requirements:**

- Phillips screwdriver size 2
- 8 mm socket wrench
- 4 mm Allen wrench
- 5 mm Allen wrench

**Uninstalling the tail light bracket:**

- Remove the complete tail light, as described in chapter 8.7.8.
- Loosen the screw on the seat frame that goes through the drill hole of the light bracket, using a 5 mm Allen wrench.
- Remove the hexagon socket head screw. Pay attention to the distance washer (1).
- Use a 4 mm Allen wrench to loosen the hexagon socket head screw (6).
- Remove the hexagon socket head screw. Pay attention to the distance washer (5) and the distance tube (3).
- Replace the lamp bracket (4).

**Installing the headlight bracket:**

- Assemble all parts again in reverse order.
- Check all vehicle functions.

## 8.8 Front wheels

### 8.8.1 Repairing a flat tire in the front

- Repair the flat tire as described in the user manual supplied with the wheel chair.

### 8.8.2 Replacing the steering head bearings on the steering wheels



---

**WARNING: Danger of crushing!**

**The mobility device is very heavy. Injury hazard to hands and feet!**

- *You should seek help from a second person.*

**Injury hazard caused by uncontrolled movement of the mobility device!**

- *Switch the power supply off (ON/OFF key).*
  - *Engage the drive.*
  - *Before raising the vehicle, secure the wheels by blocking them with wedges.*
- 



---

**CAUTION!**

**Incorrect reassembly can damage the bearings and cause the steering wheels to fall out!**

*The single-row angular ball bearing rings are not identical on both sides! There is only one correct way to insert them!*

- *Follow the assembly instructions precisely!*
- 



---

**Requirements:**

- open-ended spanner, 19 mm
  - Torque wrench
  - large screwdriver, flat
  - wooden block (approx. 12 x 12 x 30 cm for propping up vehicle)
- 



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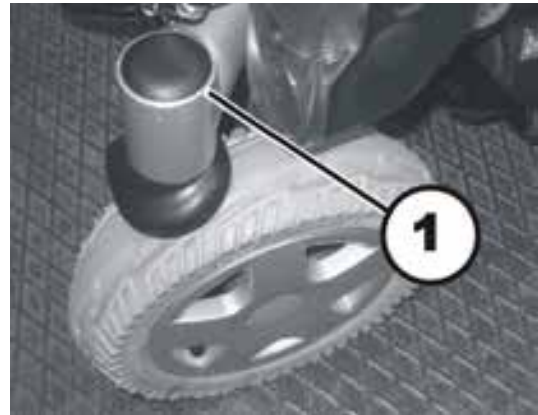
**Note**

When disassembling, take care of small parts such as screws and washers. Put all small parts down so that they can be reassembled in the right sequence.

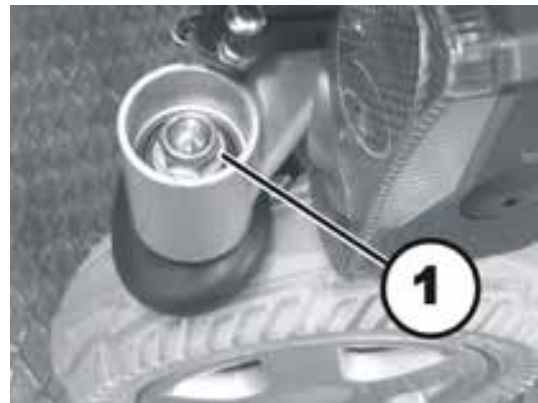
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- Place the wooden block under the vehicle on the side on which the ball bearing is to be replaced.
- The wheel on the side where the bearing is to be replaced must have enough ground clearance to enable it to be pulled out of the bearing.
- Secure the vehicle against rolling away.

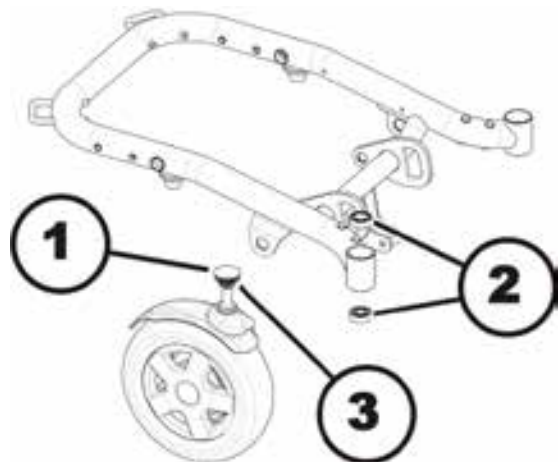
- Carefully remove the plastic cap (1) with the large screwdriver.



- Loosen the 19 mm nut (1) with the socket spanner and remove it. Hold the wheel so that it does not rotate when the nut is being removed.
- Pull the steering head shaft upwards out of the steering head tube.
- Take the washers out of the tube.
- Take the ball bearing out of the tube.



- The adjacent figure shows an overview of the individual parts.
- Plastic cap
- Ball bearing
- 19 mm nut



- Reassembly takes place in reverse order to disassembly
- Ensure that you insert the ball bearings exactly as described below.
- Also ensure that the washers are correctly replaced.

**CAUTION!**

**Incorrect reassembly can damage the bearings and cause the steering wheels to fall out!**  
*The single-row angular ball bearing rings are not identical on both sides! There is only one correct way to insert them!*

- *The bearings must always be assembled so that the narrow borders of the ball bearings are facing each other (inside)!*
- *The steering head bolts and nuts must always be pressing against the wide (outside) border of the ball bearings! Otherwise, the bearings will be pressed apart and damaged by the bolts!*

The illustrations show the wide border of the ball bearing on the outside of the ball race (A) and the narrow ball bearing edge on the inside (B).



After assembly, the steering wheels should rotate freely but the bearings should have no play.

- First tighten the nuts to 20 Nm +/- 2 Nm.
- Then loosen them slightly.
- Then retighten to 15 Nm +/- 1.5 Nm.

### 8.8.3 Changing a front wheel (normal front wheel)



**WARNING: Danger of crushing!**

**The mobility device is very heavy. Injury hazard to hands and feet!**

- *You should seek help from a second person.*

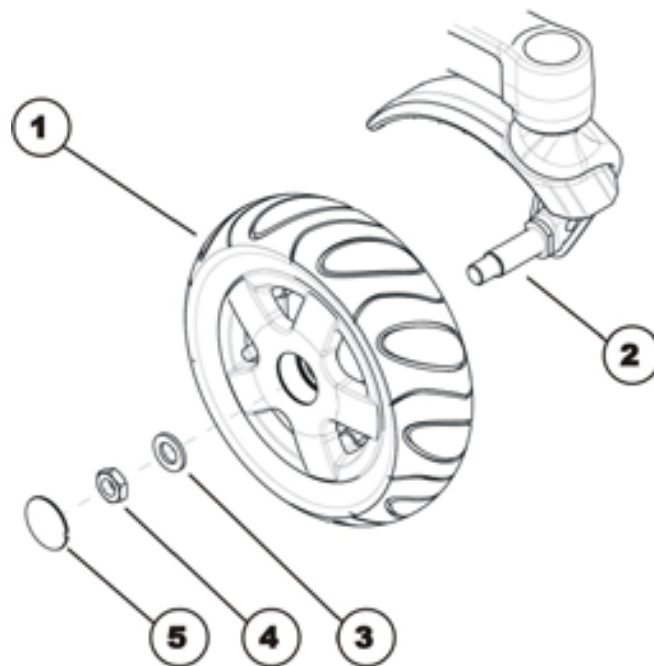
**Injury hazard caused by uncontrolled movement of the mobility device!**

- *Switch the power supply off (ON/OFF key).*
- *Engage the drive.*
- *Before raising the vehicle, secure the wheels by blocking them with wedges.*



**Requirements:**

- 24 mm socket wrench
- 24 mm open-ended wrench
- Flat screwdriver
- Oblong wooden blocks, at least 14 x 14 x 30 cm
- Medium strength thread locking adhesive, for example Loctite 243
- Heat gun



**Removing the wheel:**

- With the aid of a second person, jack up the mobility aid using several wooden blocks.
- Use a Phillips screwdriver to remove the plastic cap (5).
- Heat up the nut (4) using the heat gun to soften up the thread locking adhesive. Alternatively, you can counter the axle (2) using a 24 mm wrench to prevent it from rotating.
- Loosen and remove the nut with a 24 mm socket spanner.



- Remove the washer (3).
- Take the wheel (1) off the axle (2).

**Refitting the wheel:**

- Refit the parts in reverse order.
- When installing the wheel, pay attention to the correct direction of rotation.
- Apply medium strength thread locking adhesive to the nut (4) when re-positioning it.

### 8.8.4 Changing a front wheel (normal front wheel)



**WARNING: Danger of crushing!**

**The mobility device is very heavy. Injury hazard to hands and feet!**

- You should seek help from a second person.

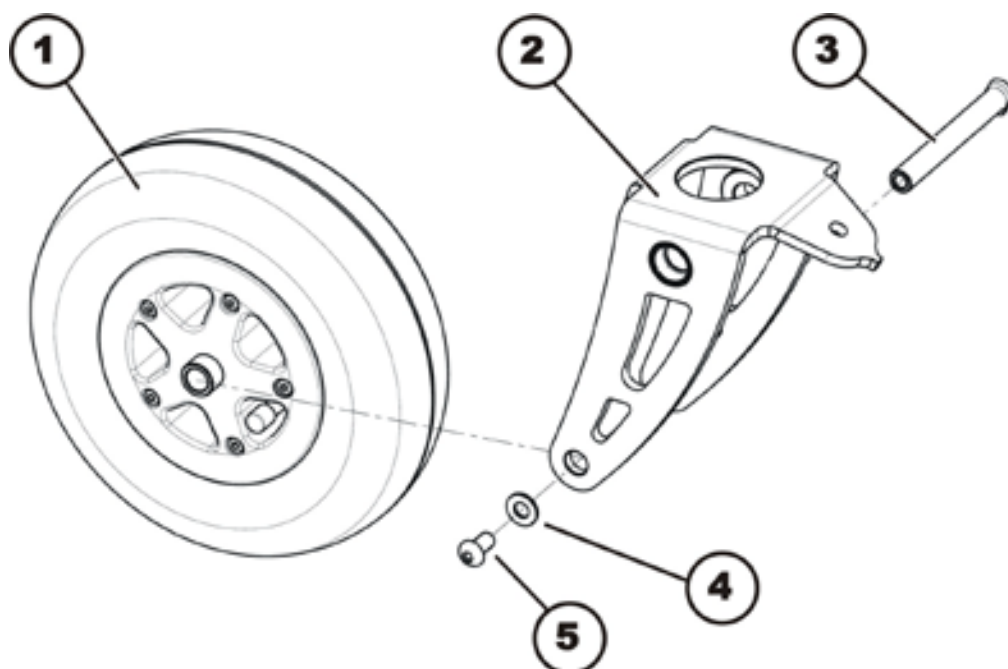
**Injury hazard caused by uncontrolled movement of the mobility device!**

- Switch the power supply off (ON/OFF key).
- Engage the drive.
- Before raising the vehicle, secure the wheels by blocking them with wedges.



**Requirements:**

- 5 mm Allen key
- 13 mm open-ended wrench
- Oblong wooden blocks, at least 14 x 14 x 30 cm



**Removing the wheel**

- Prop up the wheelchair on multiple wooden blocks with the help of a second person.
- Counter the axle (3) using an open-end wrench.
- Loosen and remove the hexagon socket head screw (5). Pay attention to the washer (4).
- Pull the axle out of the front fork (2).
- Pull the wheel (1) out of the front fork.

**Assembling the wheel:**

- Assemble the parts in reverse order.
- When installing the wheel, pay attention to the correct direction of rotation.

## 8.9 Drive wheels

### 8.9.1 Replacing the drive wheel

**WARNING: Danger of crushing!**

The mobility device is very heavy. Injury hazard to hands and feet!

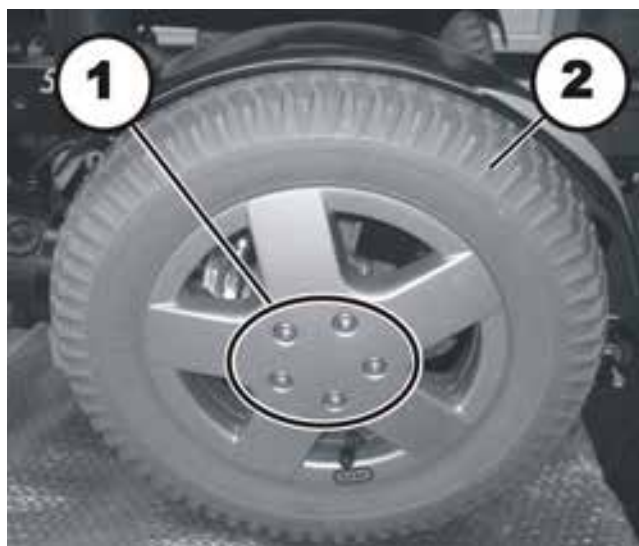
- You should seek help from a second person.

**Injury hazard caused by uncontrolled movement of the mobility device!**

- Switch the power supply off (ON/OFF key).
- Engage the drive.
- Before raising the vehicle, secure the wheels by blocking them with wedges.

**Requirements:**

- 6 mm Allen key
- Long wooden blocks, min. 14 x 14 x 30 cm

**Removing the drive wheel:**

- Lift the mobility aid up on one side and get a second person to place a wooden block around 14 cm high underneath it so that the drive wheel is suspended freely.
- Loosen the four or five 6 mm Allen screws (1).
- Take the wheel (2) off the wheel hub.

**Refitting the drive wheel:****NOTE**

Please ensure that the wheel is re-fitted on the same side and in the same running direction as removed.

- Refit the wheel in reverse order.

## 8.9.2 Replacing a tyre or inner tube

**Note**

There are three different types of tyres or inner tubes, and specific points must be observed for the replacement of each type.

It is easy to tell the difference between the tyre or inner tube types:

- Pneumatic tyres have black valve caps.
- Puncture-protected tyres have red valve caps
- puncture-proof tyres have no valves.

Please proceed in accordance with the appropriate chapter:

- Replacing pneumatic tyres – see user manual
- Replacing puncture-protected tyres – see chapter 8.9.2.1
- Replacing puncture-proof tyres – see chapter 8.9.2.2

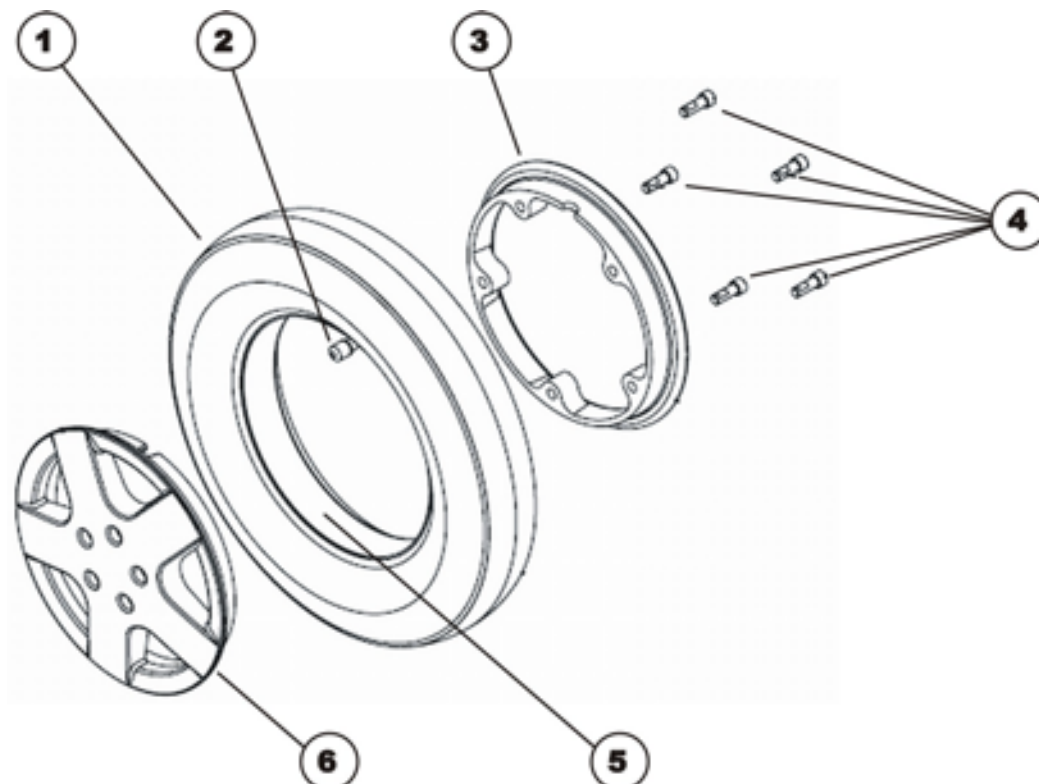
### 8.9.2.1 Replacing puncture-protected tyres

**Note**

Pneumatic tyres have black valve caps. Puncture-protected tyres have red valve caps

**Requirements:**

- 6 mm Allen key
- Two long wooden blocks, min. 14 x 14 x 30 cm
- Tyre pump or compressor
- Talcum powder



**Removing the tyres:**

- Remove the wheel as described in chapter 8.9.1.



---

**ATTENTION: Explosion hazard!**

**If the wheelchair is fitted with pneumatic tyres, the wheel can explode if the air is not released from the tyre before removing the wheel!**

- *Always release the air from the wheel before you remove it. Depress the small tappet in the centre of the valve!*
- 



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**CAUTION!**

**Material damage hazard. The valve can become blocked by the puncture protection gel and be unusable!**

- *During the following work you should always hold the valve up so that the puncture protection gel cannot enter the valve.*
- 

- Remove the valve cover (2).
- Press the release pin in the valve inwards and evacuate all the air from the tyre.
- Undo the five 6 mm Allen screws (4) on the inside of the wheel.
- Remove the inner (3) and outer (6) ring of the rim from the tyre (1).
- Replace any defective or worn parts.

**Refitting the tyres:**

- Refit the inner tube in the tyre.



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**Note**

If the old inner tube is to be repaired and re-used, and has become wet during repair, you can make replacement easier by sprinkling the inner tube with a little talcum powder.

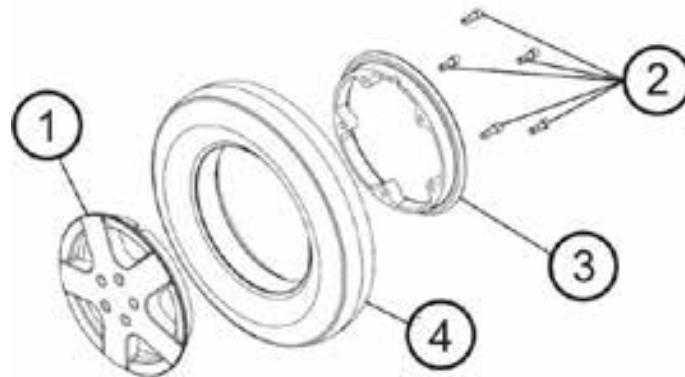
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- Refit rim rings (3) and (6) to the tyre. Please ensure that the boreholes and thread for the screws are exactly above each other.
- Fill some air into the inner tube.
- Refit the five Allen screws on the inner side of the wheel and tighten them.
- Check the exact fit of the tyre on the rim.
- Inflate the tyre to the prescribed air pressure.
- Re-check the exact fit of the tyre on the rim.
- Screw the valve cap back on.
- Refit the wheel.

### 8.9.2.2 Replacing puncture-proof tyres


**Requirements:**

- 6 mm Allen key
- Two long wooden blocks, min. 14 x 14 x 30 cm
- Three joiner's clamps with plastic caps
- Torque spanner 5 - 25 Nm (or similar)
- Talcum powder


**Removing the tyres:**

- Remove the wheel as described in chapter 8.9.1.


**ATTENTION: Explosion hazard!**

**There is considerable pressure in the tyre. Danger of injury! Parts can be thrown out and injure you if you do not secure the rim rings.**

- *Secure the rim rings with joiner's clamps.*

- Secure the rim rings against unexpected discharge with three joiner's clamps. When doing so, ensure that you do not scratch the rims.
- Undo the five 6 mm Allen screws (2) on the inside of the wheel.
- Now loosen the joiner's clamps carefully and alternately until you can remove the rim rings without danger.
- Remove the inner (3) and outer (1) ring of the rim from the tyre (4).
- Replace any defective or worn parts.

**Refitting the tyres:**

- Refit the tyres to the rim in the reverse sequence.
- When fitting the rim rings together, ensure that the drillholes and threads for the bolts are placed exactly above each other.
- Place the joiner's clamps in position.
- Tighten the joiner's clamps alternately in small stages until the rim rings are precisely aligned.
- Tighten the Allen screws (2) to 18 Nm.

### 8.9.3 Replacing the drive wheel hub

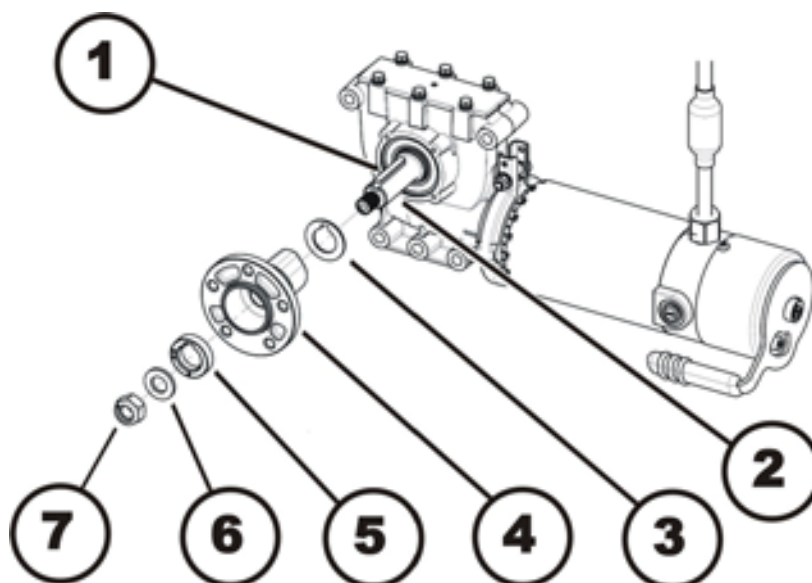
**CAUTION!**

**Possible material damage to mobility device! Collisions can be caused if the adjusting washers are removed during fitting work to the drive wheels!**

- *Adjusting washers are often fitted between the drive shaft and the wheel hub to even out tolerances. If these adjusting washers are removed and not replaced again, collisions can be caused.*
- *Always replace the adjusting washers exactly as they were before you started dismantling.*

**Requirements:**

- 19 mm socket spanner

**Uninstalling a drive wheel hub:**

- Use the 19 mm socket wrench to loosen and remove the nuts (7).
- Remove the washer (6).
- Remove the distance ring (5).
- Pull the wheel hub (4) off of the axle (2).
- Remove the shim ring (3).
- Remove the feather key (1) from the axle.

**Installing a drive wheel hub:**

- Assemble the parts of the wheel hub in reverse order.
- Use a thin film of lubricant to replace the wheel hub on the axle.

## 8.10 Drive unit

### 8.10.1 Replacing the motor/transmission unit

**WARNING: Danger of crushing!**

The mobility device is very heavy. Injury hazard to hands and feet!

- You should seek help from a second person.

**Injury hazard caused by uncontrolled movement of the mobility device!**

- Switch the power supply off (ON/OFF key).
- Engage the drive.
- Before raising the vehicle, secure the wheels by blocking them with wedges.

**ATTENTION: Danger of crushing!**

The motor gearbox unit is extremely heavy. Injury hazards to hands!

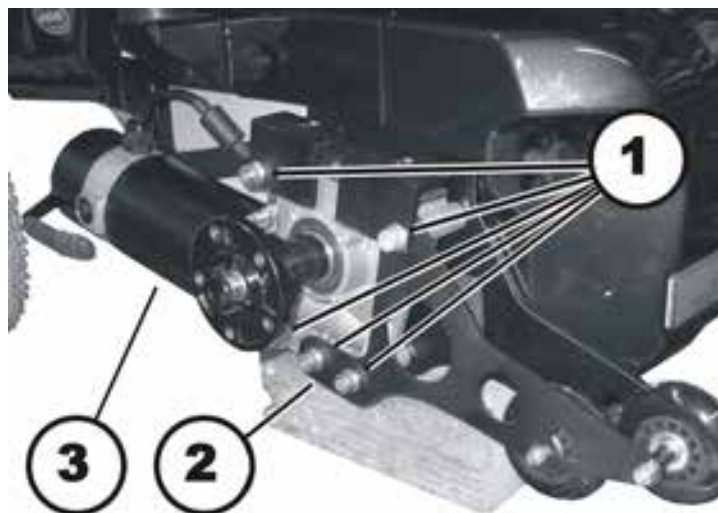
- Please note the high weight

**Requirements:**

- 6 mm Allen key
- 19 mm socket spanner
- long wooden blocks, min. 14 x 14 x 30 cm

**Removing the motor/transmission unit:**

- Switch the electronics OFF on the remote.
- Remove the rear battery box cover, as described in chapter 8.1.1.
- Pull the motor plug out of the power module.
- Open the cable clamps and expose the motor cable.
- Remove the drive wheel as described in chapter 8.9.1.
- Remove the wheel hub as described in chapter 8.9.3.
- Remove the splash guard as described in chapter 9.1.2.





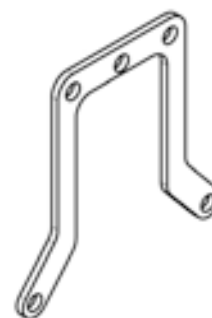
- Use a 6 mm Allen wrench and a 13 mm socket wrench to loosen and remove the four hexagon socket head screws (1).
- Remove the screws together with the washers.
- Pull the motor/gear box unit (3) forwards out of its holder (2). Take into account the heavy weight of the unit.

**Refitting the motor/transmission unit:**

- Replace the defective components.
- Before installing a new motor / gearbox unit, make sure the sealing ring is correctly mounted. The sealing ring securely attaches the motor and the gearbox. The ring must be installed such that the self-locking nut is located on the outside.
- If the sealing ring is incorrectly installed, rotate it around as described in chapter **8.10.2**.
- Check the serial number of the gearbox housing.

Up to the serial number 20110400xx, the gearbox housing is 44.5 mm wide: '  
The compensation sheet (see right) must be installed.

Up to the serial number 20110400xx, the gearbox housing is 49.5 mm wide:  
The compensation sheet is not necessary.



- Install the motor / gearbox unit in reverse order.
- Check the orientation of the motor and adjust it. Make sure that the motor cable cannot be pinched or bent, and that it is not exposed to chafing. The coupling lever must be able to move to the positions "Driving" as well as "Pushing".
- Tighten the self-locking nut of the sealing ring to a torque of 4 Nm.
- Connect the motor cable plug.
- Reinstall all components that were removed beforehand in reverse order.

### 8.10.2 Replacing or rotating the motor / gearbox unit sealing ring



**CAUTION: Danger of crushing!**

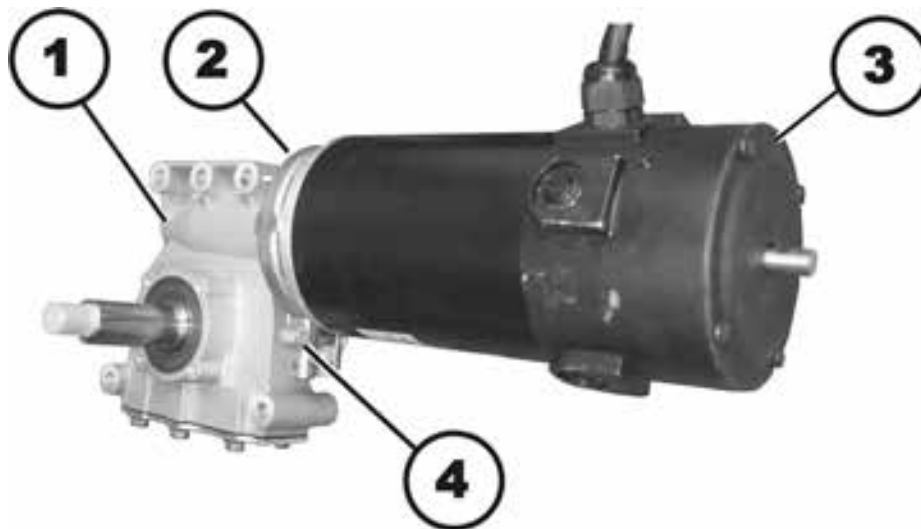
**The motor / gearbox unit is very heavy. Danger of injury to the hands!**

- *Pay attention to the heavy weight.*



**Requirements:**

- 10 mm socket wrench



**Uninstalling the sealing ring:**

- Uninstall the motor / gearbox unit, as described in chapter 8.10.1.
- Use the 10 mm socket wrench to loosen and remove the self-securing nuts (4) including the washers.
- Remove the carriage bolt, which secures the sealing ring (2).
- Carefully bend the sealing ring apart and remove it.

**Installing the sealing ring:**

- Install the sealing ring so that the square hole for the carriage bolt is on the inside of the wheelchair.
- Insert the carriage bolt through the sealing ring.
- Install the washer and the self-locking nut.
- Do not tighten the self-locking nut completely, as the motor orientation must be adjusted during installation.

### 8.10.3 Replacing the motor / gearbox coupling

**CAUTION: Danger of crushing!**

The motor / gearbox unit is very heavy. Danger of injury to the hands!

- Pay attention to the heavy weight.

**Requirements:**

- 10 mm socket wrench

**Uninstalling the motor / gearbox coupling:**

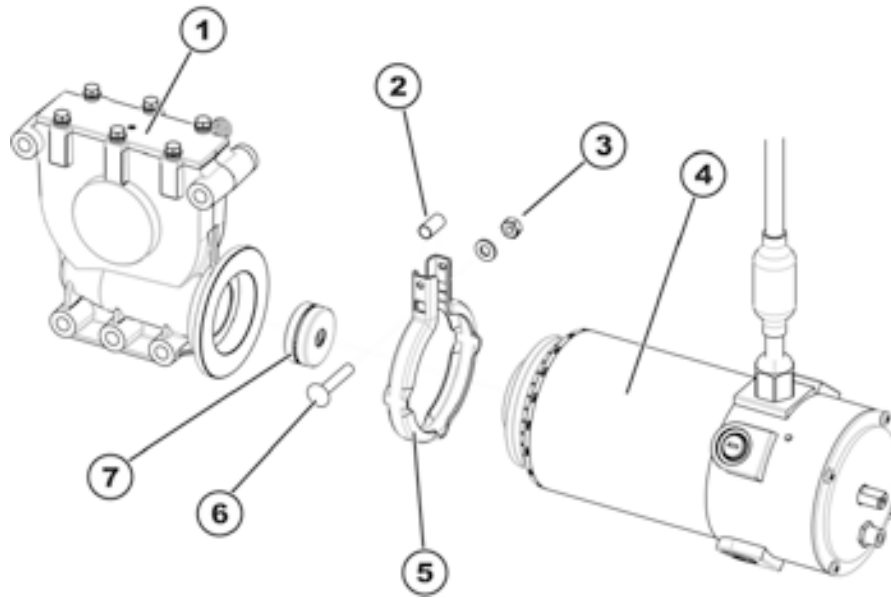
- Uninstall the motor / gearbox unit, as described in chapter 8.10.1.
- Use the 10 mm socket wrench to loosen and remove the self-securing nut (4).
- Remove the carriage bolt, which secures the sealing ring (2).
- Carefully bend the sealing ring apart and remove it.

**WARNING!**

**Danger of damage to the wheelchair if the coupling is not serviced correctly.**

- Be careful not to damage the coupling mechanism during maintenance work.

- Carefully pull the motor (3) and the gearbox (1) apart.
- Remove the component parts of the coupling.
- If necessary replace the coupling.

**Installing the motor / gearbox coupling:**

- Place the new clutch (7) on the motor axle. Pay attention to the position of the groove.
- Position the locking ring (5) on the motor (4) or the gearbox (1).
- Carefully insert the motor into the gearbox. Pay attention to the position of the groove in the axle of the gearbox. If necessary, rotate the motor and gearbox to the correct position.
- Insert the carriage bolt through the locking ring. Do not forget the spacer sleeve (2)!
- Install the washer and the self-locking nut.
- Do not tighten the self-locking nut completely, as the motor orientation must be adjusted during installation.
- Install the motor / gearbox unit, as described in chapter 8.10.1.

### 8.10.4 Replacing the carbon brushes

**Note**

The wheelchair can be equipped with 2-pole or 4-pole motors.  
Always replace all carbon brushes on both motors at the same time.  
Always use carbon brushes of identical types.

**CAUTION: Danger of crushing!**

• The mobility aid is very heavy. You should seek help from a second person!

**WARNING: Danger of crushing!**

**The mobility device is very heavy. Injury hazard to hands and feet!**

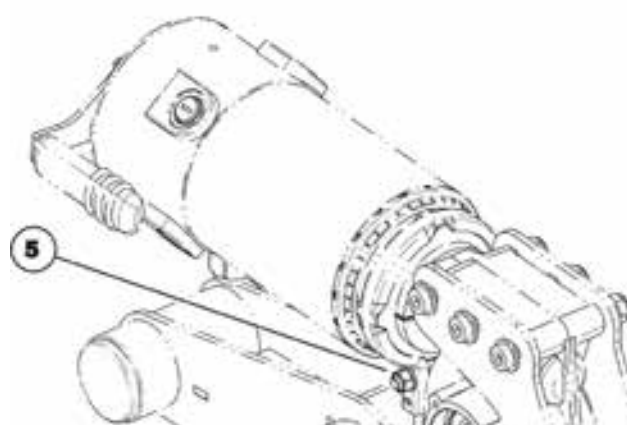
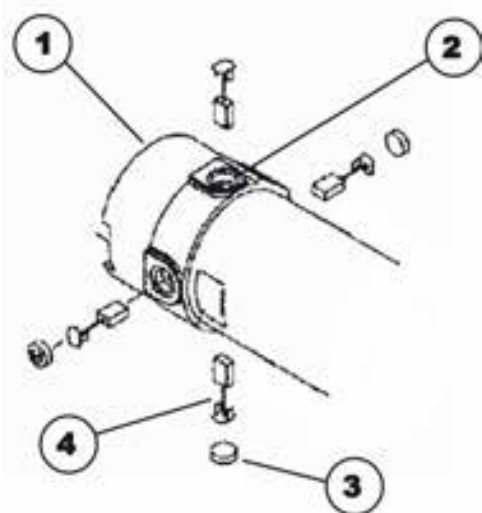
• You should seek help from a second person.

**Requirements:**

- 6 mm Allen key
- 10 mm socket spanner
- blade screwdriver
- long wooden blocks, min. 14 x 14 x 30 cm

**Removing the carbon brushes:**

- Switch off the mobility aid.
- Remove the drive wheels as described in chapter 8.9.1.



- Disengage the motor (1) by setting the engaging lever to "Push".

**Note**

In the case of the SSD motor, you can undo the bolt (5) with a 10 mm socket spanner and then turn the motor around so that you can access the rear carbon brushes more easily.

- Loosen and remove all four plastic caps (3) using a blade screwdriver.
- Note the fixing position and location of the carbon brushes.

**Note**

Used carbon brushes need to be refitted exactly in the same position from which they were taken in order to guarantee optimum contact to the collector.

- Make a marking on the motor and the carbon brushes in order to guarantee correct refitting.
- Remove the carbon brushes completely from the mounting (2).
- Check the carbon brush and spring for the level of wear, broken components or discolouration.

**Refitting the carbon brushes:**

- Depending on the condition of the brush and the spring:
  - either replace the brushes in exactly the same position from which they were taken or
  - fit new brushes.
- Refit the plastic caps and tighten them firmly.
- Turn the motor round in position so that the engaging lever can be set both to the "Push" and the "Travel" position.
- Now retighten the bolt ((5) fingertight).
- Refit the drive wheels as described in chapter 8.9.1.

**Note**

The following procedure is necessary to run the carbon brushes in after replacement and thus guarantee maximum performance.

**WARNING: Risk of accidents!****Hazards to workers, surroundings and mobility device!**

- *Do not leave the mobility device unattended during the following procedure!*
  - *Make sure that BOTH drive wheels are raised and CANNOT touch the ground.*
  - *Secure the area.*
- 
- Lift the mobility aid up on one side and get a second person to place a wooden block around 14 cm high underneath it so that the drive wheel is suspended freely.
  - Also repeat this on the other side of the mobility aid.
  - Allow the motors to run for an hour in forward direction.
  - Allow the motors to cool down for 30 minutes.
  - Allow the motors to run for an hour in reverse direction.
  - Lift the mobility aid off the wooden blocks.

## 8.11 Replacing the rubber shock absorbers



### Requirements:

- 13 mm socket wrench
- Several wooden blocks



### Note

In the following procedure steps, the wheelchair is manually lifted up and secured in this position using wooden blocks. Alternatively, you can achieve this by lifting the wheelchair using a crane or a combination of pulley and belts, if your workshop has the corresponding equipment.



### WARNING: Danger of accidents!

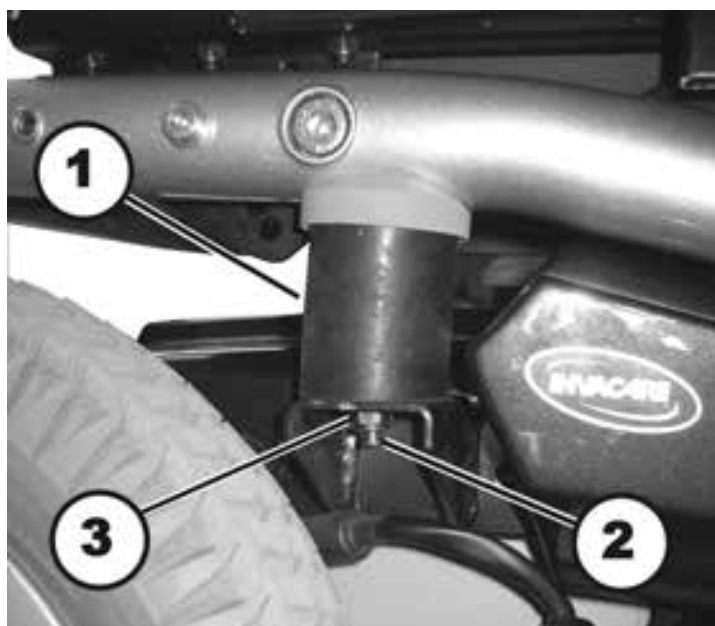
#### Danger to people, the surroundings and wheelchair!

The specifications of the crane or pulley and belts must be sufficient for the weight of the wheelchair.

- *Pay attention to the maximum load capacity of the crane and the breaking strength of the belts.*
- *Never position yourself under heavy objects suspended in the air by cranes or pulleys.*

### Uninstalling rubber shock absorbers:

- Remove the rear and the middle battery box covers, as described in chapter 8.1.1 und 8.1.2.



- Use the 13 mm socket wrench to loosen and remove the self-securing nut (3).
- Repeat this on the other side of the wheelchair.
- Lift the frame tube of the wheelchair in the rear so that the threaded pin (2) is pulled out of the guide.
- Place one or more wooden blocks between the frame tube and the battery box.
- Turn the rubber shock absorber clockwise (as seen from above) by hand and replace it.

- Repeat this on the other side of the wheelchair.

**Installing rubber shock absorbers:**

- Assemble the parts in reverse order.
- Tighten the rubber shock absorbers and nuts hand-tight.



## 8.12 Replacing the tube frame

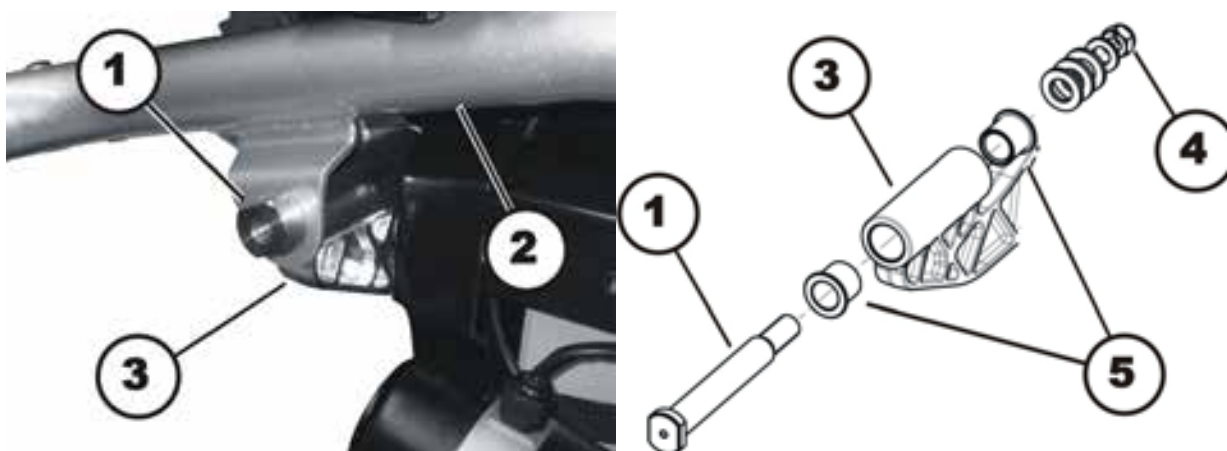


### Requirements:

- 4 mm Allen wrench
- 5 mm Allen wrench
- 11 mm socket wrench
- 13 mm socket wrench
- 19 mm socket wrench
- 13 mm open-ended wrench
- 24 mm open-ended wrench
- 19 mm box wrench
- torque wrench 20 – 200 Nm
- wooden blocks

### Disassembling the tube frame:

- Remove both batteries, as described in chapter 8.4.
- Remove both lateral covers, as described in chapter 8.1.3.
- Remove the seat, together with the tilt module, as described in chapter 8.16.
- Remove both tail light brackets, as described in chapter 8.7.9.
- Remove both rubber shock absorbers, as described in chapter 8.11.
- Remove both front forks, as described in chapter 8.8.2.



### WARNING!

#### Risk of damage to the tube frame.

- *You should counter the bearing bolt against slippage, but do not turn it.*
- Secure the bearing bolt (1) against slippage using a second 24 mm open-end wrench.
- Use a 19 mm box wrench to loosen the nut (4).
- Remove the bearing bolt. Pay attention to the self-locking nut (4), the washers as well as the sliding bushing (5).
- Repeat these work steps on the other side of the wheelchair.
- Lift the tube frame (2) off of the double bearing of the Dual Swing Technology (D.S.T.).

**Assembling the tube frame:**

- Assemble the parts in reverse order.
- Tighten the self-locking nuts (4) to a torque of 120 Nm.

## 8.13 Replacing the double bearing of the Dual Swing Technology (D.S.T.)

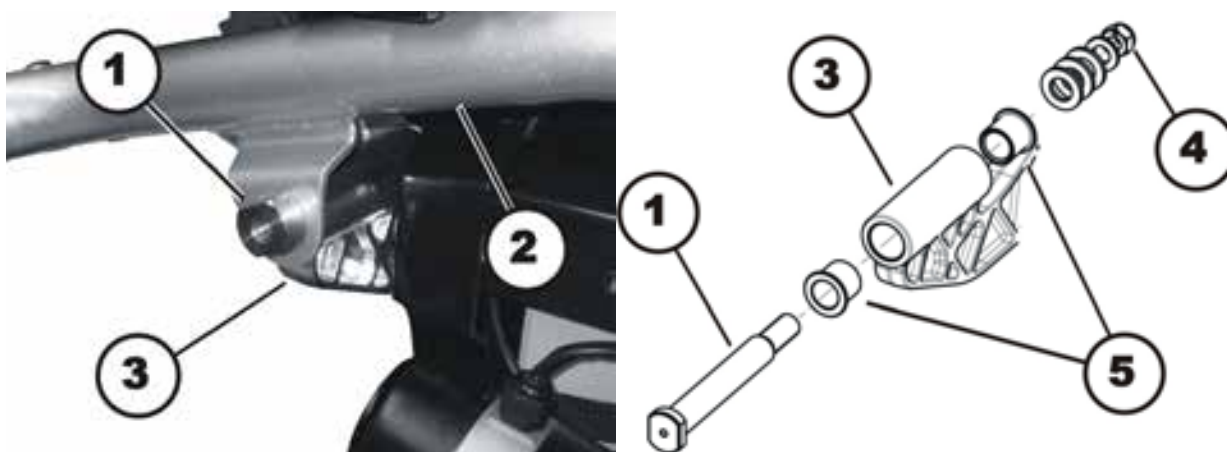


### Requirements:

- 4 mm Allen wrench
- 5 mm Allen wrench
- 10 mm Allen wrench
- 11 mm socket wrench
- 13 mm socket wrench
- 13 mm open-ended wrench
- 24 mm open-ended wrench
- 36 mm open-ended wrench
- 24 mm box wrench
- torque wrench 20 – 200 Nm
- wooden blocks

### Disassembling the double bearing of the Dual Swing Technology (D.S.T.)

- Remove both batteries, as described in chapter 8.4.
- Remove the middle cover, as described in chapter 8.1.2.
- Remove both lateral covers, as described in chapter 8.1.3.
- Remove all cables that run from the electronic modules on the battery box to the seat (for example to the remote or actuators) or to the tube frame (for example to the lighting system).
- Place wooden blocks under the battery box, so that it is secured in its present position.
- Loosen the lower screws on both rubber shock absorbers, as described in chapter 8.11.



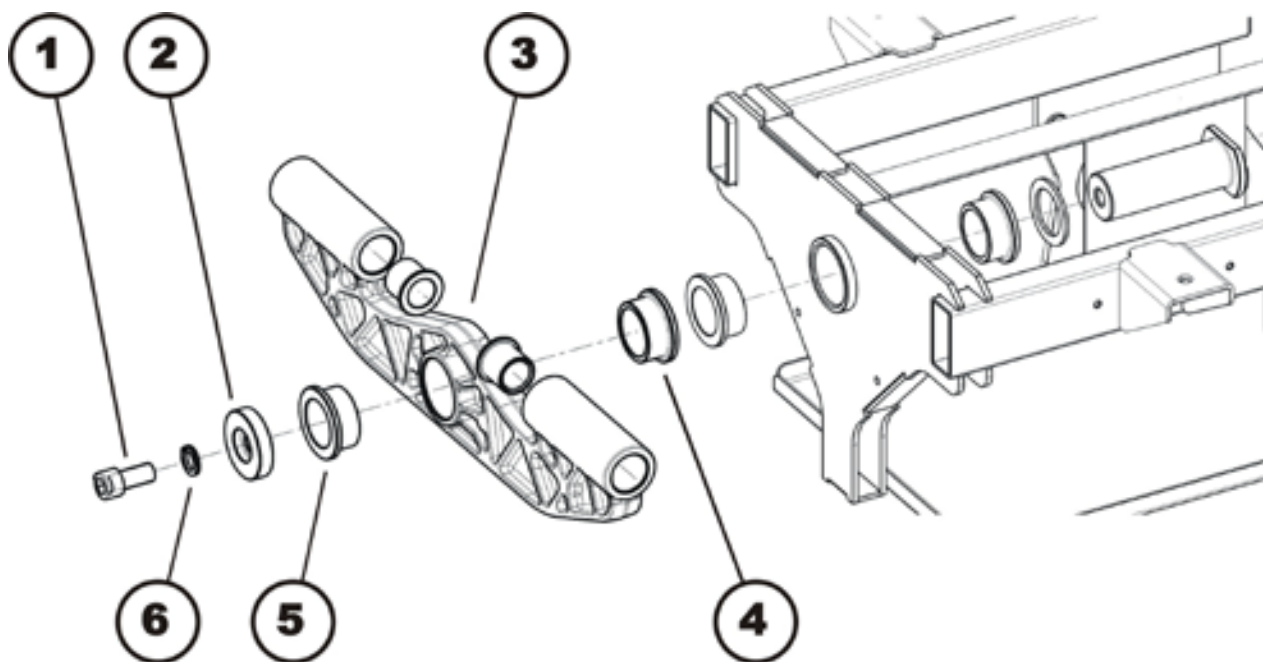
### WARNING!

#### Risk of damage to the tube frame.

- *You should counter the bearing bolt against slippage, but do not turn it.*

- Secure the bearing bolt (1) against slippage using a second 24 mm open-end wrench.
- Use a 19 mm box wrench to loosen the nut (4).
- Remove the bearing bolt. Pay attention to the self-locking nut (4), the washers as well as the sliding bushing (5).

- Repeat these work steps on the other side of the wheelchair.
- Push the seat and the tube frame to one side on the front wheels. Make sure the tube frame does not get scratched during this procedure.



- Use a 10 mm Allen wrench to loosen the hexagon socket head screw (1).
- Remove the hexagon socket head screw together with the Nord-Lock washer (6) and the spacer ring (2).
- Pull the double bearing (3) off of the bearing bolt.
- Remove and inspect the floating bearings (4) & (5). Replace the bearings if they are damaged or worn.
- Replace the double bearing.

#### **Assembling the double bearing of the Dual Swing Technology (D.S.T.)**

- Assemble the parts in reverse order.
- Tighten the hexagon socket head screw (1) to a torque of 80 Nm.
- Tighten the self-locking nuts of the bearing bolts (4) to a torque of 120 Nm.

## 8.14 Replacing the battery boxes



### Requirements:

- 4 mm Allen wrench
- 5 mm Allen wrench
- 6 mm Allen wrench
- 10 mm Allen wrench
- 8 mm socket wrench
- 11 mm socket wrench
- 13 mm socket wrench
- 13 mm open-ended wrench
- 24 mm open-ended wrench
- 24 mm box wrench
- Phillips screwdriver, size 2
- torque wrench 20 – 200 Nm
- Wooden blocks (approx. 12 x 12 x 30 cm) for jacking up the vehicle

### Uninstalling the battery box:

- Remove the rear and the middle covers, as described in chapter 8.1.1 und 8.1.2.
- Remove the splash guards, as described in chapter 9.1.2.
- Remove both lateral covers, as described in chapter 8.1.3.
- Take exact note of the positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.
- Remove all electronic modules, as described in chapter 8.28.4 and its subchapters.
- Remove both batteries, as described in chapter 8.4.
- Remove both drive wheels, as described in chapter 8.9.1.
- Remove both motor/gear box units, as described in chapter 9.1.2.
- Remove the seat, together with the tilt module, as described in chapter 8.16.
- Remove both rubber shock absorbers, as described in chapter 8.11.
- Remove the double bearing of the Dual Swing Technology (D.S.T.), as described in chapter 8.13.
- Remove the front cover, as described in chapter 8.1.4.
- Replace the battery box.

### Installing the battery box:

- Assemble the parts in reverse order.

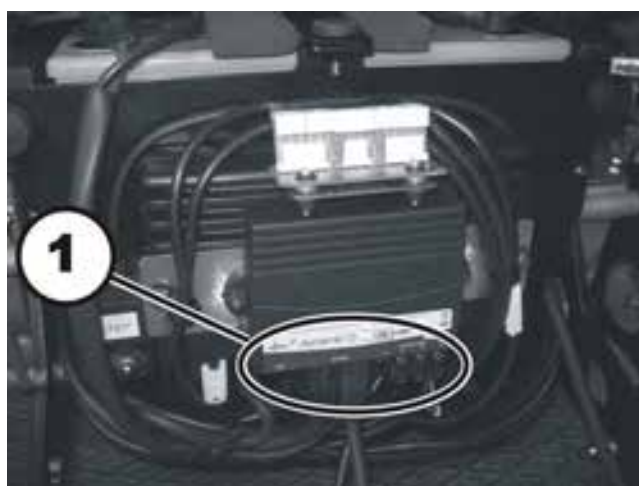
## 8.15 Replacing the tilt actuator



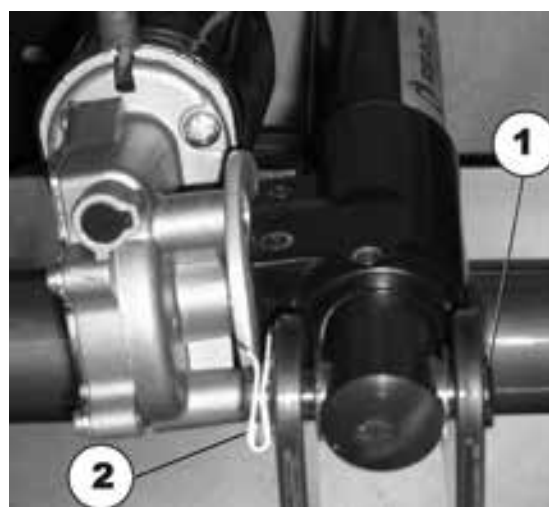
### Requirements:

- flat screwdriver, blade width approx. 6 mm
- oblique pliers
- small hammer
- cable binder

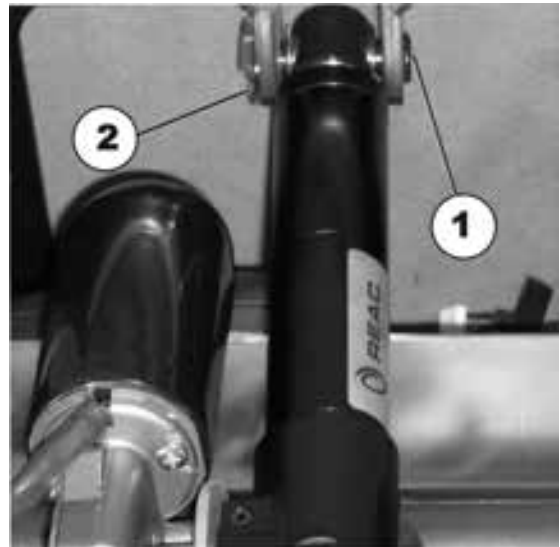
- Remove the legrests.
- Switch the electronics OFF on the remote.
- Remove the rear and the middle covers, as described in chapter 8.1.1 und 8.1.2.
- Take exact note of the positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.



- Disconnect the plug (1) of the actuator to be tested from the actuator module.
- Pull the actuator cable out of the wheelchair. If necessary, also remove the cable ties.
- Remove the SL fuse (2) on the bottom fixing bolt (1) with the screwdriver.
- Pull the fixing bolt (1) out.



- Remove the SL fuse (2) on the top fixing bolt (1) with the screwdriver.
- Pull the fixing bolt (1) out.



- Pull the adjustment spindle out together with the actuator.
- Insert the new adjustment spindle with the actuator.
- Reinsert the fixing bolts and SL fuses. Fix the SL fuses securely to the fixing bolt with the hammer.
- Connect the plug of the actuator to the electronic module.
- Fasten the actuator cable to the frame with new cable ties. Position the cable such that it does not get abraded or pinched.
- To complete, check all seat tilting functions.

## 8.16 Replacing the tilt module



**WARNING: Danger of crushing!**

**The seat and its support are very heavy. Danger of injury to hands and feet!**

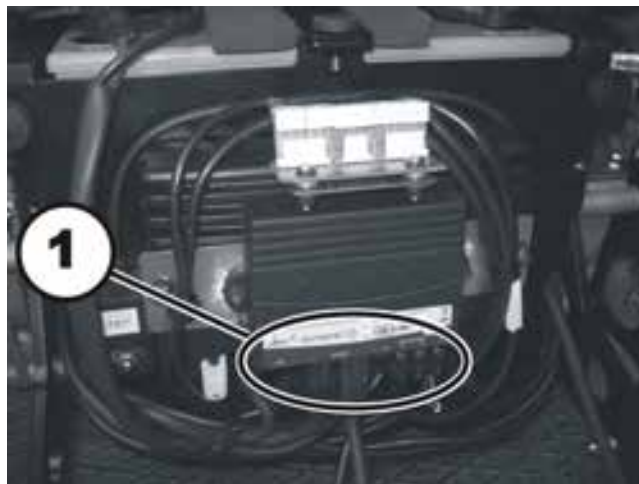
- *Let a second person help you.*



**Requirements:**

- 10 mm Allen wrench
- 13 mm open-ended wrench
- 24 mm open-ended wrench
- 24 mm box wrench
- Side cutting pliers
- Cable ties

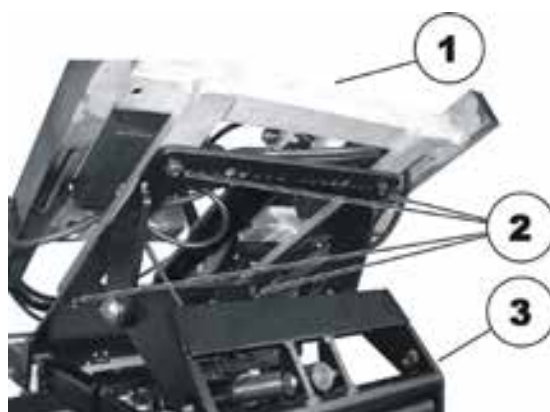
- Remove the legrests.
- If possible, tilt the seat back as far as it will go.
- Switch the electronics OFF on the remote.
- Remove the rear and the middle covers, as described in chapter 8.1.1 und 8.1.2.
- Take exact note of the positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.



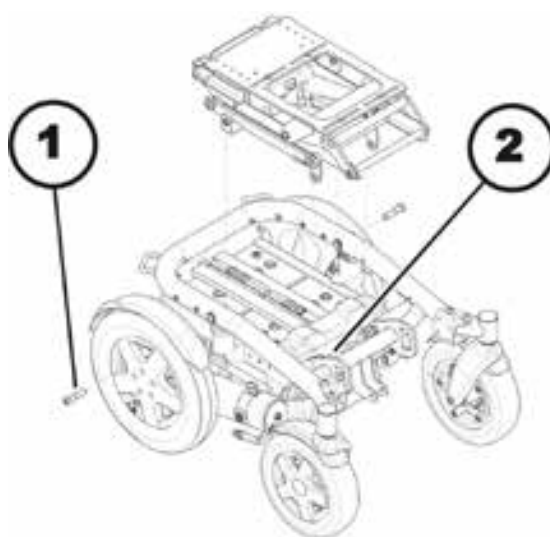
- Disconnect the plug (1) of the actuator to be tested from the actuator module.
- Pull the actuator cable out of the wheelchair. If necessary, also remove the cable ties.



- Loosen and remove the four screws (2). Depending on the tilt module, use a 13 mm open-end wrench for all four screws or a 5 mm Allen key for the two in the front, and a 13 mm open-end wrench for the two in the back.
- Remove the seat support (1) from the tilt module (3).



- Use the 10 mm Allen wrench to loosen and remove both screws (1).
- Use the 24 mm open-end wrench and the 24 mm box wrench to loosen and remove both screws (2).
- Remove the lifter from the vehicle frame and replace it.



- Re-assembly is done in reverse order.
- Test all functions of the vehicle.

## 8.17 Replacing the lifter / tilt module



**WARNING: Danger of crushing!**

**The seat is very heavy. Danger of injury to hands and feet!**

- *Let a second person help you.*



**Requirements:**

- 5 mm Allen key
- 6 mm Allen key
- Side cutting pliers
- Cable ties



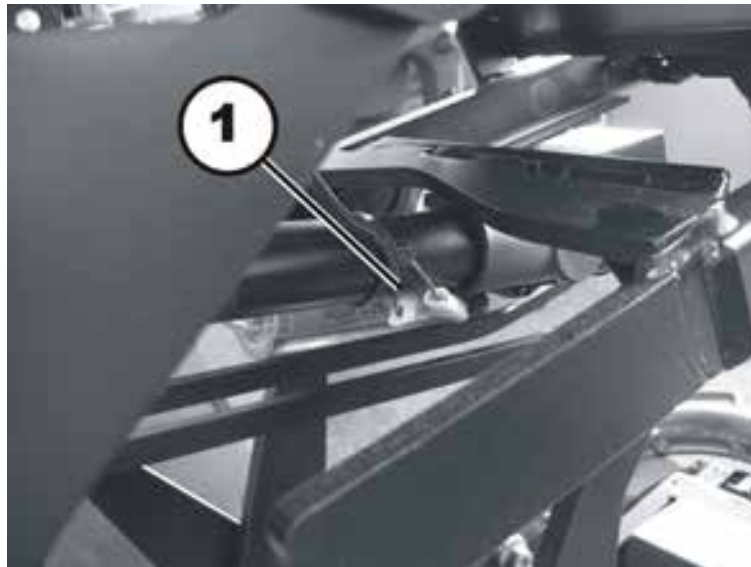
**Note**

Take careful note of the exact position of the seat. Mark the position it is mounted in, the angle and so on. If necessary, make photographs with a digital camera.

Any modification of the adjustment of the seat affects the centre of gravity of the wheelchair.

**Uninstalling the lifter / tilt module:**

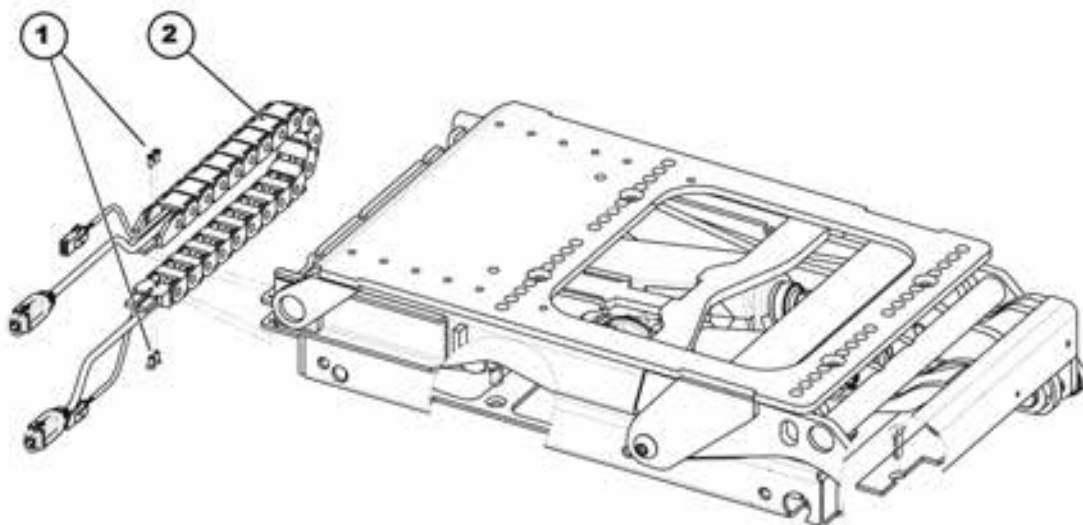
- If possible, raise the lifter to the highest position.
- If possible, tip the wheelchair with the tilt module as far backwards as it will go.
- Switch the electronic control system off.



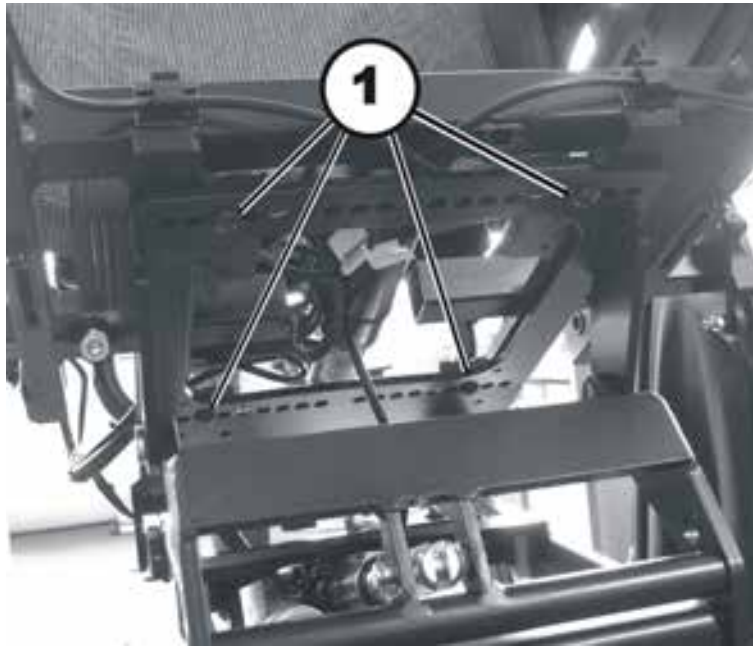
- Disconnect the plug at the height of the tilt actuator (1).



- Open the power supply chain of the lifter:
  - Flip the cover (1) up.
  - Pull the flap (2) out of the cover.
  - Repeat this procedure link by link.
- Remove both cable ties that secure the cable at the ends of the power supply chain.
- Pull the cable out of the power supply chain.



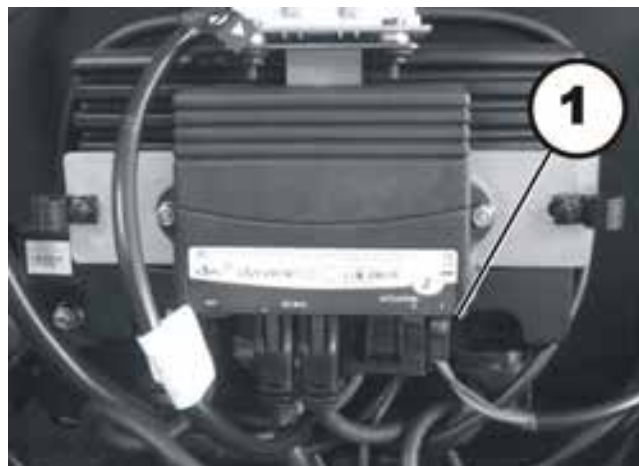
- Use the Phillips screwdriver to loosen the screws (1).
- Remove the power supply chain (2).
- Loosen the screws of the magnet with a Phillips screwdriver.
- Remove the magnet.
- Loosen the screws of the sensor with a Phillips screwdriver.
- Remove the sensor.

**WARNING: Danger of crushing!**

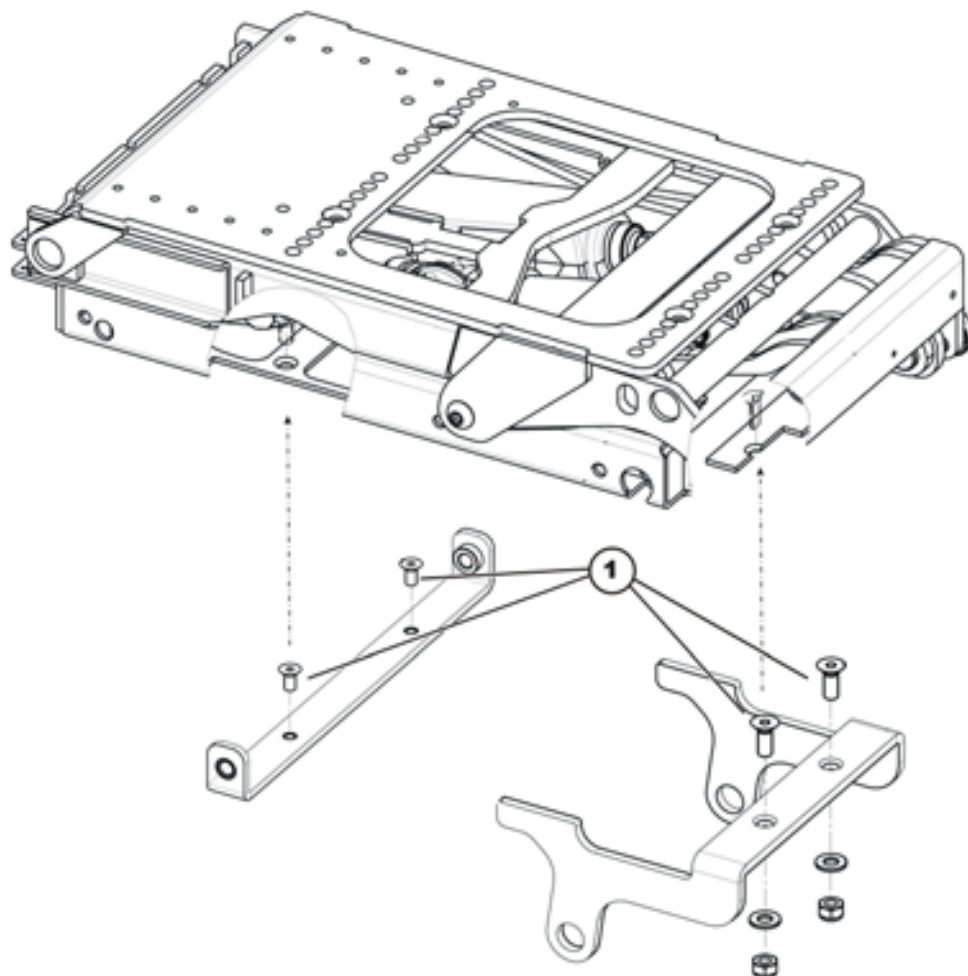
**The seat is very heavy. Danger of injury to hands and feet!**

- *Let a second person help you.*

- Loosen the four screws (1) that attach the seat to the lifter / tilt module using a 5 mm Allen key.
- Together with a second person, lift the seat up off of the lifter module / tilt module.



- Disconnect the plug (1) from the actuator module.
- Free up all cables so that you can lift the seat off.



- Loosen the four screws (1).
- Lift the lifter / tilt module out of the frame.

#### Installing the tilt module:

- Install the tilt module in reverse order. Make sure that seat tilt mounting brackets (2) are affixed with screws to the top holes in the seat frame brackets (5).
- Tighten the connecting screws of the seat tilt mounting brackets and the seat frame mounting brackets to 18 Nm.
- When installing the cables again, make sure that they are placed in such a way that they cannot be crushed or damaged in any position of the tilt module.



#### **WARNING: Danger of crushing!**

**The seat is very heavy. Danger of injury to hands and feet!**

- *Let a second person help you.*

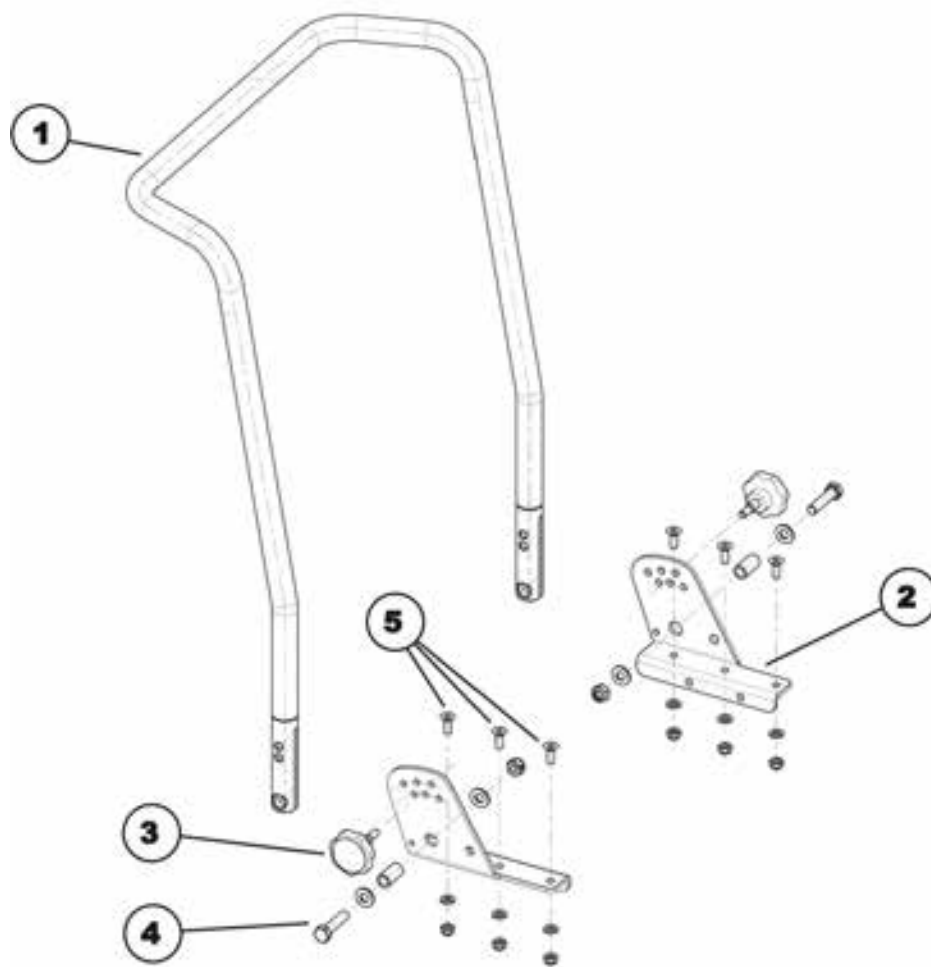
- Install the seat.
- Install all covers again.
- Check all functions of the vehicle and go for a test drive.

## 8.18 Backrest unit

### 8.18.1 Replacing the standard backrest

**Requirements:**

- 5 mm Allen key
- open-ended spanner, 10 mm
- open-ended spanner, 13 mm

**Dismantling the backrest unit:**

- Remove the backrest cushion.
- Undo and remove the handwheels (3).
- Use two 13 mm socket spanners to undo the bolts (4) including the nuts and washers on the left-hand and right-hand side of the chair.
- Remove the backrest tube (1) from the backrest holders (2).
- If the backrest holders also need to be replaced: Undo and remove the Allen screws (5) including the nuts and washers on the left-hand and right-hand side of the chair. To do this, use a 5 mm Allen key and a 10 mm socket spanner.

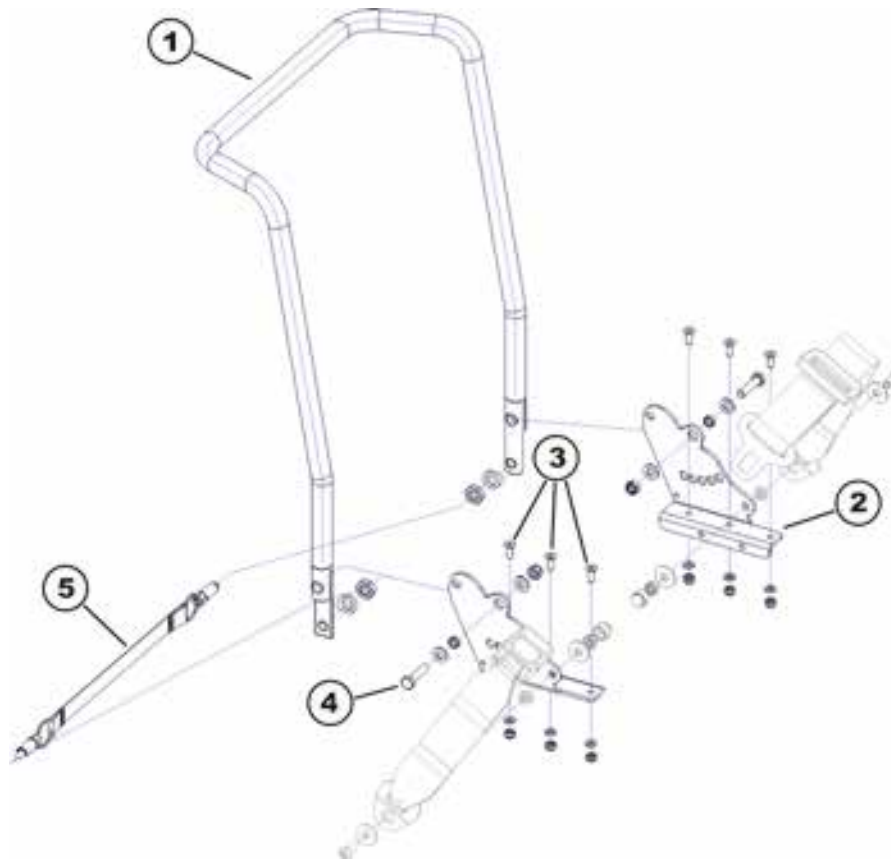
**Refitting the backrest unit:**

- Replace the parts in the reverse order.
- To conclude, you should always carry out a trial run to test the vehicle functions.

### 8.18.2 Replacing a standard backrest with quick release

**Requirements:**

- 5 mm Allen key
- open-ended spanner, 10 mm
- open-ended spanner, 13 mm

**Dismantling the backrest unit:**

- Remove the backrest cushion.
- Use two 13 mm socket spanners to undo the bolts (4) including the nuts and washers on the left-hand and right-hand side of the chair.
- Pull the quick release cord (5) to unlock the backrest tube.
- Entfernen Sie das Rückenrohr (1) von den Rückenhaltern (2).
- If the backrest fixations are to be replaced also:  
Loosen and remove the hexagon socket head screws (3) including the nuts and washers on the left and right side of the chair. Use a 5 mm Allen key and a 10 mm socket wrench for this purpose.

**Refitting the backrest unit:**

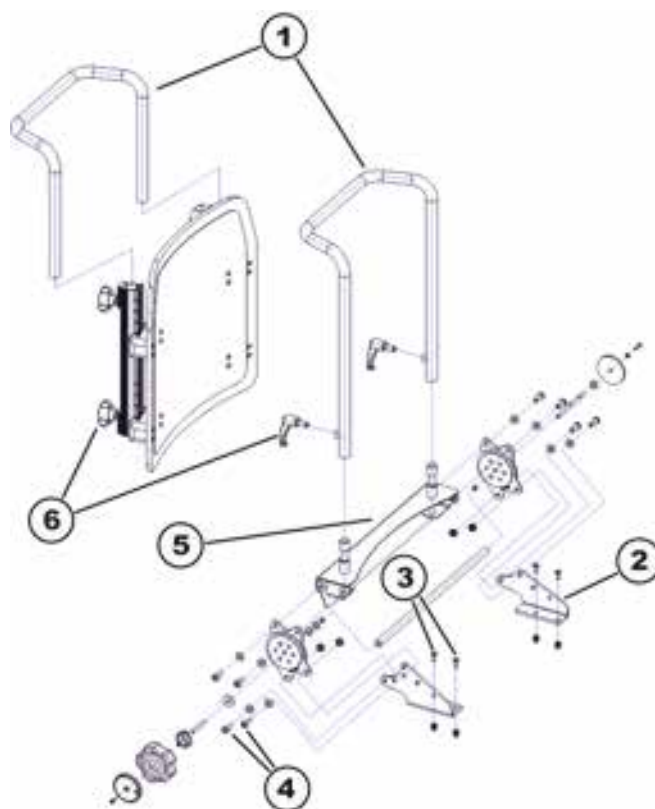
- Replace the parts in the reverse order.
- To conclude, you should always carry out a trial run to test the vehicle functions.



### 8.18.3 Replacing a Flex 2 backrest

**Requirements:**

- 5 mm Allen key
- open-ended spanner, 10 mm
- open-ended spanner, 13 mm

**Dismantling the backrest unit:**

- Remove the backrest cushion.
- Loosen the hand wheels (6).
- Remove the backrest tube (1) from the backrest fixation plate (5).
- Loosen and remove the screws (4), including the nuts and washers, with a 5 mm Allen key and a 13 mm socket wrench on the left and right side of the chair.
- Remove the backrest fixation plate (5) together with the planetary gear boxes.
- If the backrest fixations (2) are to be replaced also:  
Loosen and remove the hexagon socket head screws (3) including the nuts and washers on the left and right side of the chair. Use a 5 mm Allen key and a 10 mm socket wrench for this purpose.

**Refitting the backrest unit:**

- Replace the parts in the reverse order.
- To conclude, you should always carry out a trial run to test the vehicle functions.

## 9 Installing accessories

### 9.1 Splash guard

#### 9.1.1 Replacing a front splash guard



**WARNING: Danger of crushing!**

**The wheelchair is very heavy. Danger of injury to the hands and feet!**

- *Let a second person help you.*

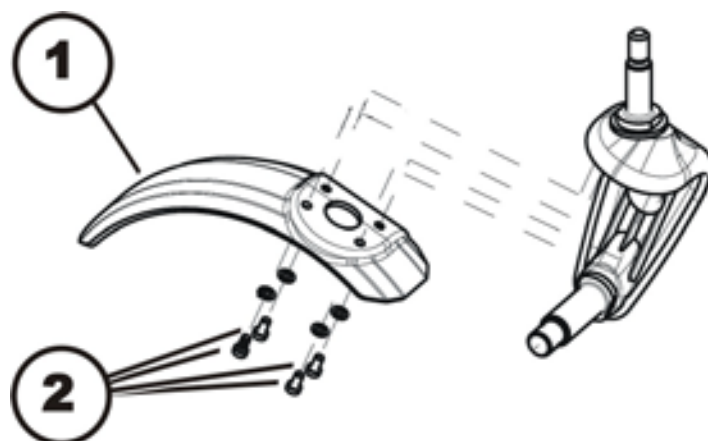
**Danger of injury due to uncontrolled movement of the wheelchair!**

- *Switch the vehicle's power system off (ON-/OFF key).*
- *Engage the drive motors.*
- *Secure the vehicle against rolling away by placing wedges under the wheels.*



**Requirements:**

- 4 mm Allen wrench
  - 24 mm socket wrench
  - 24 mm open-ended wrench
  - Flat screwdriver
  - Oblong wooden blocks, at least 14 x 14 x 30 cm
  - Medium strength thread locking adhesive, for example Loctite 243
  - Heat gun
- Lift the wheelchair on one side and have a second person place a 14 cm high wooden block underneath it, so that the front wheel is off the ground and can rotate freely.
  - Remove the front wheel, as described in chapter 8.8.3.



**Removing the splash guard:**

- Loosen and remove the four hexagon socket head screws (2) together with the washers.
- Replace the splash guard (1).

**Installing a splash guard:**

- Assemble the parts in reverse order.

### 9.1.2 Replacing a rear splash guard

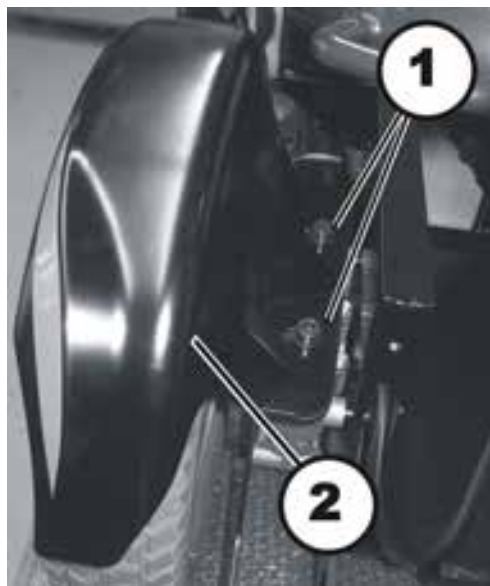
**Requirements:**

- 6 mm Allen wrench

**Note**

Different splash guards must be fitted, depending on the seat depth, seat width and which seat support plates are installed.

- Use the following table to determine which splash guards must be fitted and whether the splash guards need to be replaced.

**Removing the splash guard:**

- Loosen and remove both hexagon socket head screws (1) together with the washers.
- Remove the splash guard (2) from the gearbox holder (3).
- Replace the splash guard.

**Installing a splash guard:**

- Assemble the parts in reverse order.

## 9.2 Replacing the holding strap

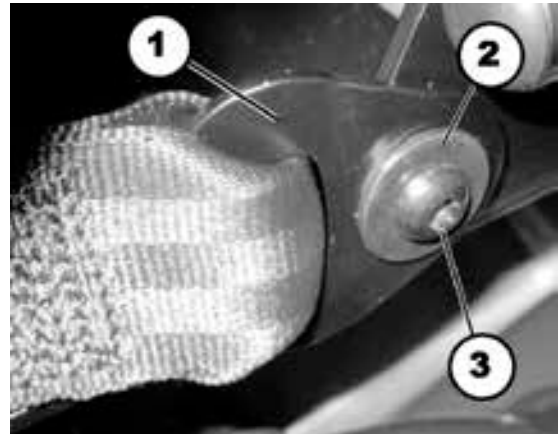
**Requirements:**

- open-ended spanner, 13 mm
- 5 mm Allen key

**Note**

A nut is fixed between the two washers (2) and (4) as a spacer so that the belt mounting can rotate freely.

- Remove the plastic cap (5).
- Loosen the bolt (3) and the associated nut (in the figure this is covered by the plastic cap) with a 5 mm Allen key and a 13 mm socket spanner.
- Remove the nut.
- Remove the bolt including safety belt and flat washers (2) and (4).
- Remove the flat washers (4).
- Replace the safety belt (1).
- Refit the parts in the reverse order.



## 9.3 Operating hours counter

### 9.3.1 Replacing the operating hours counter

**Requirements:**

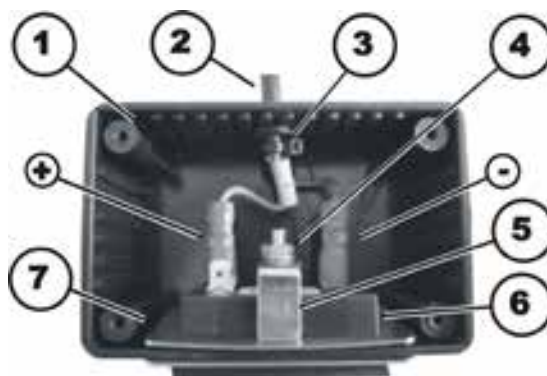
- Philipps screwdriver, size 2
- 7 mm open-end wrench

The operating hours counter is located in the side cover.

- Disconnect the plug-in connection of the operating hours counter from the drive motor.
- Remove the side cover, as described in chapter 8.1.3.
- Detach the operating hours counter from the side cover.



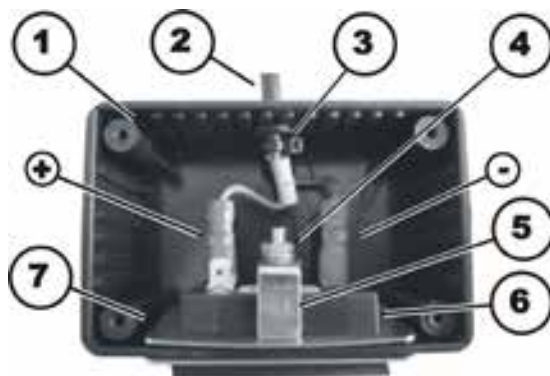
- Disconnect the plugs (+) & (-).
- Remove the nut (4) including the locking washer.
- Pull the operating hours counter (6) forwards out of the casing (1). Pay attention to the mounting bracket (5) and the retaining frame (7).
- Replace the operating hours counter.

**CAUTION!**

Property damage can result if the counter is wrongly connected. If the plus and minus wires are connected the wrong way, it will damage the electronic components of the operating hours counter.

- *Make sure the cable is connected correctly.*

- Assembly of the operating hours counter is carried out in the reverse order.
- Connect the plug of the blue wire (-) to the plug contact of the operating hours counter which is marked with a "2".
- The blue wire is additionally marked with a minus symbol.
- Connect the plug of the brown wire (+) to the plug contact of the operating hours counter which is marked with a "1".
- The blue wire is additionally marked with a sleeve, which has a plus symbol on it.
- Assemble all remaining parts again in reverse order.



### 9.3.2 Replacing the connecting cable of the operating hours counter

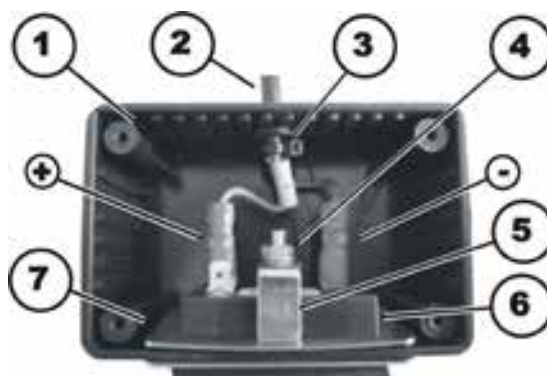
**Requirements:**

- Philipps screwdriver, size 2
- Side cutters
- Cable ties

- The operating hours counter is located in the side cover.
- Disconnect the plug-in connection of the operating hours counter from the drive motor.
- Remove the side cover, as described in chapter 8.1.3.
- Detach the operating hours counter from the side cover.
- Turn the operating hours counter around.
- Loosen and remove the four Phillips screws of the housing.



- Disconnect the plugs (+) & (-).
- Remove the cable ties (4).
- Carefully pull the connecting cable (2) of the operating hours counter out of the casing (1).
- Replace the cable of the operating hours counter.

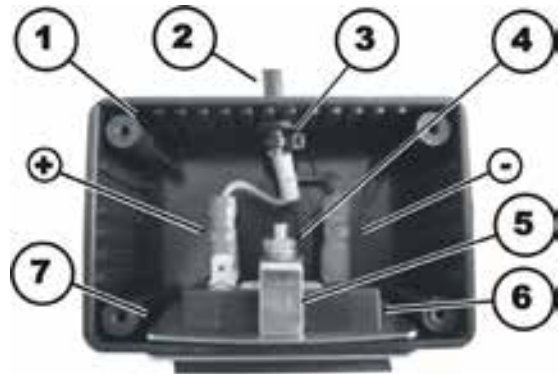


**CAUTION!**

Property damage can result if the counter is wrongly connected. If the plus and minus wires are connected the wrong way, it will damage the electronic components of the operating hours counter.

- *Make sure the cable is connected correctly.*

- Assembly of the operating hours counter is carried out in the reverse order.
- Protect the cable from tension using a cable tie (3).
- Connect the plug of the blue wire (-) to the plug contact of the operating hours counter which is marked with a "2".
- The blue wire is additionally marked with a minus symbol.
- Connect the plug of the brown wire (+) to the plug contact of the operating hours counter which is marked with a "1".
- The blue wire is additionally marked with a sleeve, which has a plus symbol on it.
- Assemble all remaining parts again in reverse order.



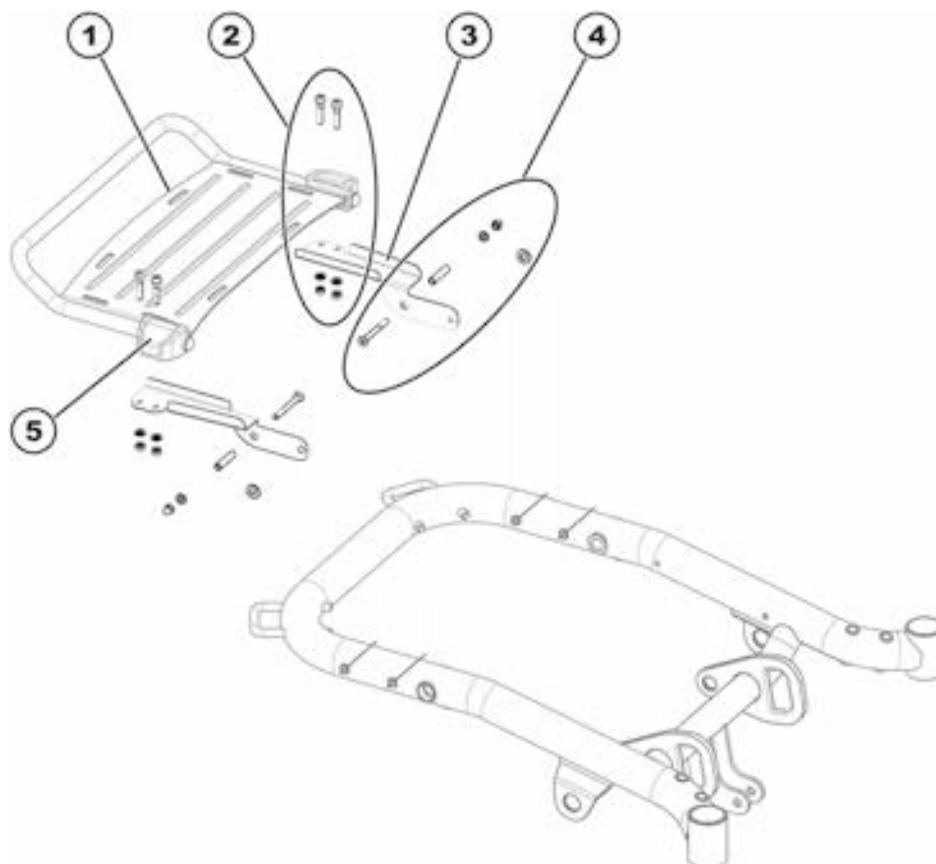


## 9.4 Luggage carrier



### Requirements:

- 5 mm Allen wrench
- 10 mm open-ended wrench



- If no conventional lighting system is installed:  
Loosen and remove both hexagon socket head screws (4) together with the washer.
- If a conventional lighting system is present:  
Loosen and remove both of the hexagon socket head screws (4) including the washers, spacer sleeve, etc. Also see chapter 8.7.9.
- Install the luggage carrier fixation bracket (3).
- If a conventional lighting system is present:  
Install the light bracket. Also see chapter 8.7.9.
- Install both hexagon socket head screws (4) together with the washers, spacer sleeve, etc.
- Repeat these work steps on the other side of the wheelchair.
- Open the clamping levers (5) of the luggage carrier fixation bracket.
- Push the brackets onto the luggage carrier (1).
- Install the luggage carrier with the brackets. When tightening the screws (2), make sure that the luggage carrier is correctly centered.

- Close both of the clamping levers.
- Make sure that the luggage carrier does not collide with the backrest or seat when adjusting the backrest angle or seat tilt to any setting.
- If collisions can occur:
  - Open the clamping levers of the luggage carrier fixation bracket.
  - Push the luggage carrier slightly towards the rear.
  - Close the clamping levers of the luggage carrier fixation bracket.

## 9.5 Further accessories



### **Note**

You can find the installation guides for further accessories at <http://www.invacare.com>

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## 10 Adjusting the seating position

In order to adapt the mobility device optimally to the requirements of the user, we recommend that you ask your authorised Invacare® the dealer to adjust the seat depth individually.

Adapting the seat to the user's seating position depends on which seat has been fitted, and should be carried out in the following sequence.

1. Adjusting the seat height
2. Adjusting the center of gravity of the seat frame
3. Adjusting the seat
4. Checking that the swivel castors can move freely
5. Repetition of steps 2 to 4, if necessary



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### **WARNING!**

**Danger of injury hazard after tilting of mobility caused by blocked steering wheels.**

- *Always check the seat depth settings for both forward and reverse movement. Make sure that steering wheels can rotate freely and have not contact to any fixed mobility device component.*
- 



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### **WARNING: Danger of crushing!**

**The seat is very heavy. Danger of injury to hands and feet!**

- *Let a second person help you.*
- 



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### **What needs to be observed when adjusting the seat depth?**

If the seat depth is too short, the force required when the user stands up is too high. If the seat depth is set too long, the user may "slump down" while getting up.

---

## 10.1 Adjusting the seat height

### 10.1.1 12°-Tilt Module with Standard seat or Flex 2 seat


**Requirements:**

- 4 mm Allen wrench
- 13 mm open-ended wrench
- Screwdriver, flat, width approx. 6 mm
- Small hammer


**WARNING: Danger of crushing!**

The seat is very heavy. Danger of injury to hands and feet!

- Let a second person help you.

Overview of the fixations points, depending on the desired seat height and the seat which is installed:

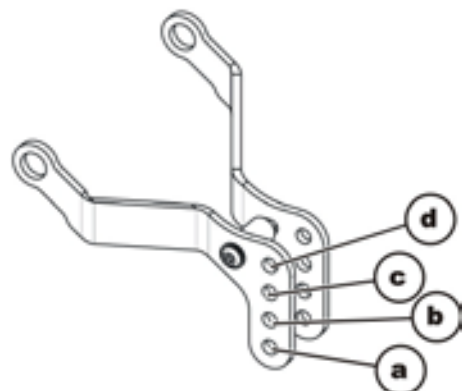
Seat height in cm	12° tilt with standard seat				Actuator holder			
	A	B	C	D	a	b	c	d
42	X				X			
44		X				X		
46			X				X	
48				X				X

Seat height in cm	12° tilt with Flex 2 seat				Actuator holder			
	A	B	C	D	a	b	c	d
46		X				X		
48			X				X	
50				X				X

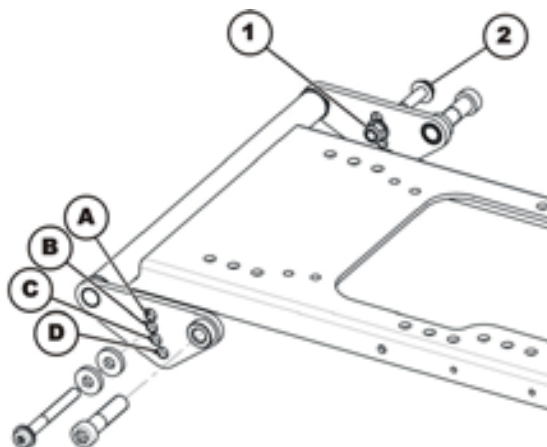
#### Adjusting the actuator holder on the chassis

Detailed instructions on the actuator can be found in chapter 8.15.

- Use the screwdriver to remove the SL-retainer of the lower holding bolt.
- Place a support under the seat.
- Pull the holding bolt.
- Adjust the actuator with holding bolt to the desired height, according to the above table.
- Secure the holding bolt with the SL-retainer



- Use the open-end wrench to loosen and remove the self-securing nut (1). Pay attention to the washer while doing so.
- Place a support under the seat.
- Pull the screw (2). Pay attention to the washers while doing so.
- Adjust the seat with the screw (2) to the desired height, according to the above table.
- Re-position the nut (1) and tighten.



### 10.1.2 20° tilt module with Flex 2 seat


**Requirements:**

- 5 mm Allen wrench
- Screwdriver, flat, width approx. 6 mm
- Small hammer


**WARNING: Danger of crushing!**

**The seat is very heavy. Danger of injury to hands and feet!**

- *Let a second person help you.*

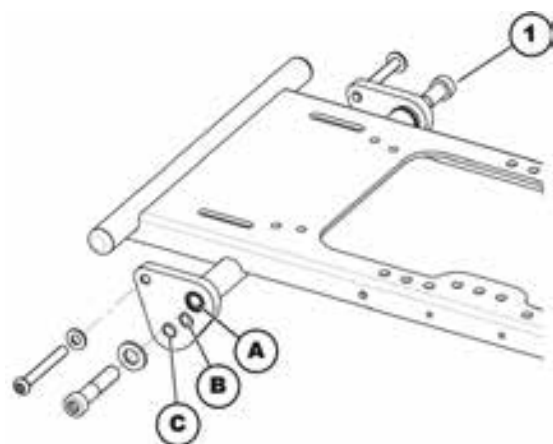
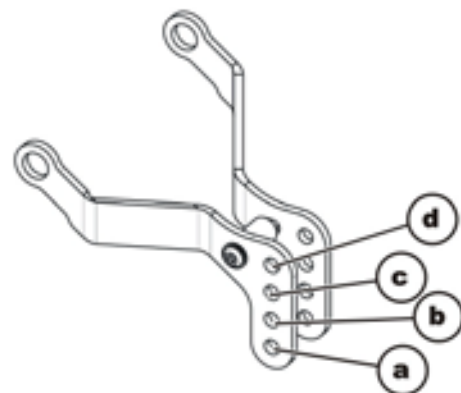
**Overview of the fixation points, depending on desired seat height:**

Seat height in cm	20° tilt with Flex 2 seat			Actuator holder		
	B	C	D	b	c	d
46	X			X		
48		X			X	
50			X			X

#### Adjusting the actuator holder on the chassis

Detailed instructions on the actuator can be found in chapter 8.15.

- Use the screwdriver to remove the SL-retainer of the lower holding bolt.
- Place a support under the seat.
- Pull the holding bolt.
- Adjust the actuator with holding bolt to the desired height, according to the above table.
- Secure the holding bolt with the SL-retainer.
- Place a support under the seat.
- Use the Allen wrench to loosen the screw (1) and remove. Pay attention to the washer while doing so.
- Adjust the seat with the screw (1) to the desired height, according to the above table.
- Tighten the screw (1).



## 10.2 Adjusting the center of gravity of the seat

The center of gravity of the seat can be adjusted by mounting the seat frame farther towards the front or the rear on the seat support of the tilt module.

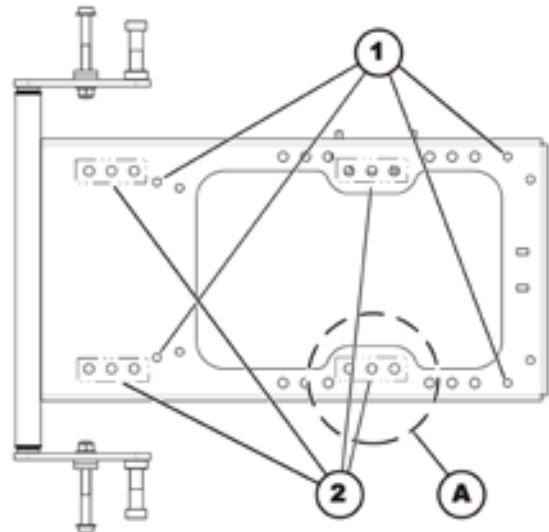
Screw fixation positions of various seats and tilt modules

### 12° tilt module

1 – Screw fixation positions of the standard seat

2 – Screw fixation positions of the Flex 2

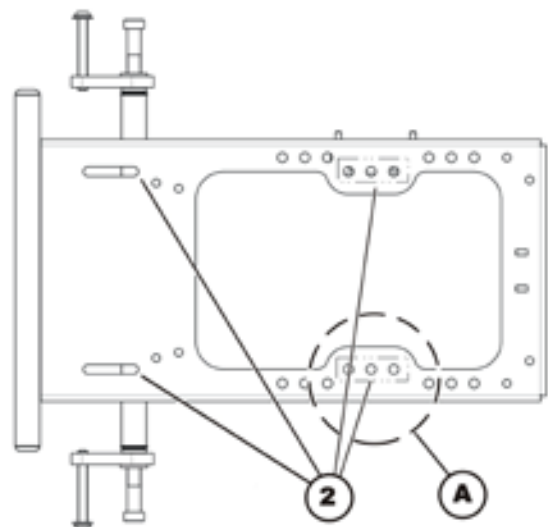
A – Screw fixation variations Flex 2,  
see details below



### 20° tilt module

2 – Screw fixation positions of the Flex 2

A – Screw fixation variations Flex 2,  
see details below

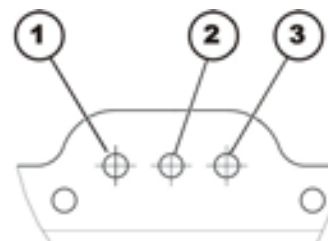


### Screw fixation variations Flex 2

1 – Rear

2 – Middle

3 – Front



### 10.2.1 Standard seat


**Requirements:**

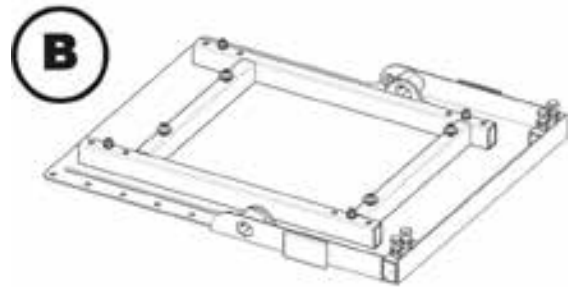
- 4 mm Allen wrench
- 5 mm Allen wrench
- 13 mm open-ended wrench
- Flat screwdriver
- Small hammer


**WARNING: Danger of crushing!**

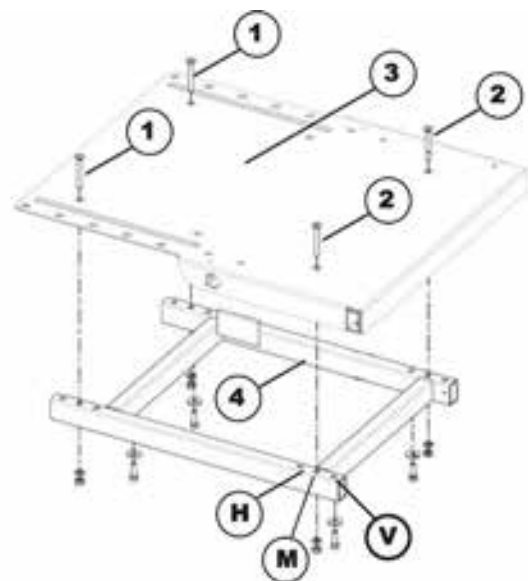
**The seat is very heavy. Danger of injury to hands and feet!**

- *Let a second person help you.*

The pictures show the standard seat from above and below.



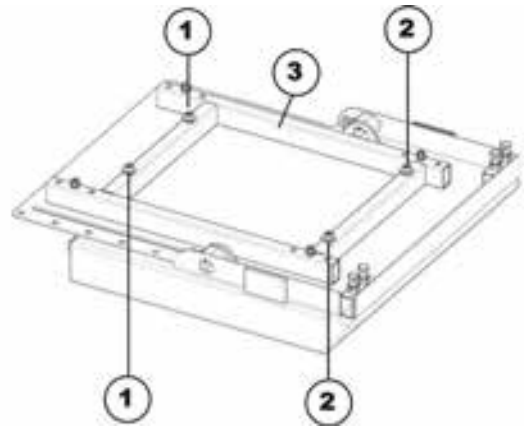
- Rear bolts (1)
- Front bolts (2)
- Seat plate (3)
- Seat frame (4)
- The seat plate can be fixed in three different positions on the seat frame.
- Front fixing (V)
- Centre fixing (M)
- Rear fixing (H)





The picture shows where the drillholes for fixing the seat frame (3) are located on the base frame.

- Rear drillholes (1)
- Front bolts (2)
- The seat frame can only be fixed in one position on the base frame.



### 10.2.2 Flex-II seat

**Requirements:**

- 4 mm Allen wrench
- 5 mm Allen wrench
- 13 mm open-ended wrench
- Flat screwdriver
- Small hammer

**WARNING: Danger of crushing!**

**The seat is very heavy. Danger of injury to hands and feet!**

- *Let a second person help you.*

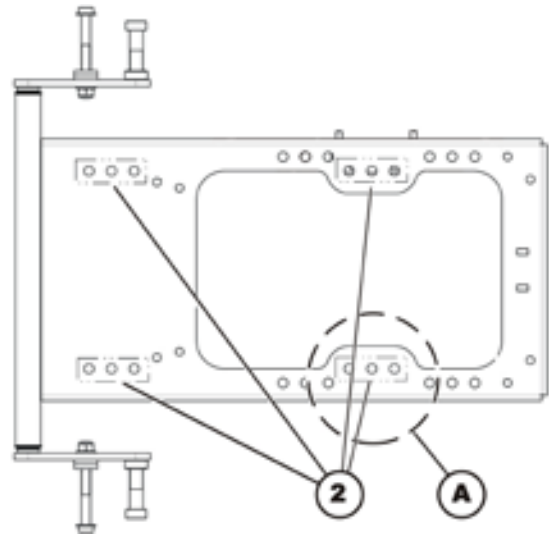
The illustrations show the Flex-2 seat from above without seat covering.

The Flex-2 seat is attached directly to the seat support.

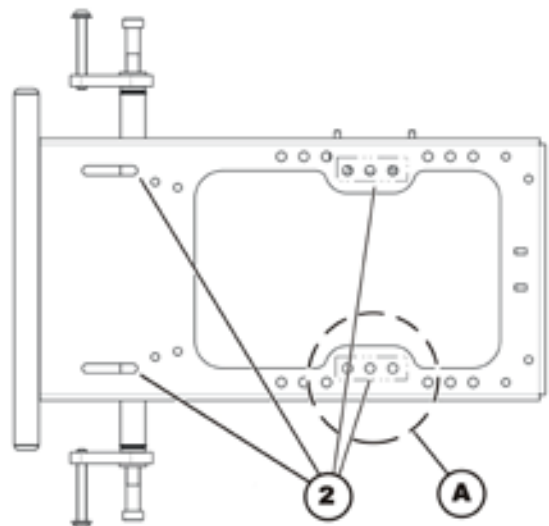


- Loosen the fixation screws at the appropriate positions (2).

12° tilt



20° tilt



- Slide the Flex 2 seat forward or rearward until the fixation screws can be inserted into the corresponding variation holes:

- 1 – Rear
- 2 – Middle
- 3 – Front

- Replace the fixation screws and tighten.
- Re-install all seat components.
- Check all functions during a test-drive.

